Naval Research Laboratory
Stennis Space Center, MS 39529-5004

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Software Test Description for the Oceanographic and Atmospheric Master Library SURF 3.1 Forecasting Program

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Oceanography Division

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The Software Test Description (STD) is written for the new SURF 3.1 model to be submitted to the Oceanographic and Atmospheric Master Library (OAML). This STD provides the user with a procedure to verify the installation of SURF 3.1 model. It contains a description of how to execute the model using a test set of nine cases. Expected output files for all test cases are included.

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1.0 SCOPE

1.1 Identification

The Software Test Description (STD), prepared for the Oceanographic and Atmospheric Master Library (OAML), provides a variety of test case input and output files to verify the installation of the SURF 3.1 model.

1.2 Document Overview

This OAML STD provides the user with a procedure to verify the installation of the SURF 3.1 model. The STD contains a description of how to execute the SURF 3.1 model using a test set of nine (9) cases. The user should compare model output from the test cases with the expected output provided within the STD for verification of the model installation.

The selected test cases exercise the subroutine components, but not necessarily all individual lines of code in each component. All the test cases selected contain acceptable values for all input fields, thus no error checking statements were exercised. A description of all the error messages is provided in Appendix A.

Manuscript approved September 28, 2000.

2.0 REFERENCED DOCUMENTS

Earle, M. D., Surf Forecasting Software Users Manual, Naval Research Laboratory (Formerly Naval Ocean Research and Development Activity) Technical Report 352, 194 pp., 1988.

Earle, M. D., Surf Forecasting Software Scientific Reference Manual, Naval Research Laboratory (Formerly Naval Ocean Research and Development Activity) Technical Note 351, 261 pp., 1989.

Earle, M. D., Surf Forecasting Software Improvements, MEC Systems Corp. (now Neptune Sciences, Inc.). Report for Naval Research Laboratory (Formerly Naval Oceanographic and Atmospheric Research Laboratory), 31 pp., 1991.

Hsu, Y.L, T.R. Mettlach, and M.D. Earle, Improvement and Validation of the Navy Longshore Current Model, Naval Research Laboratory, NRL/FR/7320-00-9927, 41pp. July, 2000.

Migues, L., Osiecki, D., and Earle, M., Software Design Document for the Oceanographic and Atmospheric Master Library SURF 3.0 Forecasting Program , N00014-94-C-6024, January 1999.

3.0 TEST PREPARATIONS

Testing of the SURF 3.1 model can be executed by two (2) input options: direct command line input or user prompted input. Direct command line input is accomplished by the following command:

Surf31.exe < A test case filename.

The user prompted input option is executed by the command:

Surf31.exe.

The user is prompted to enter an input filename. If any error occurs with either input option the user is prompted a second time to enter the input file name.

The input filename is recommended to be in the format of eight (8) characters with a three (3) character extension for both input options. The input file prefix will be the name of all the output files with the new appropriate extensions.

If an error occurs verify the executable and the input file location. If the executable and the file name are not located in the same directory the recommendation is to execute the SURF 3.1 model with the full path name of the executable location in the directory containing the actual input file. An example being: C:/models/Surf/Surf3.1.exe < input.fil.

The subroutines exercised by each of the test cases are listed in each individual test case description. The calling sequence can be verified by referring to Appendix B, which is a diagram of the SURF3.1 Model Architecture.

The nine (9) test cases were executed on various platforms to establish a range of acceptable tolerances to aid the user in correct implementation of the model. The test cases were executed on the following machines and operating systems:

PC - Gateway G6 Pentium II 233 - Windows NT 4.0

PC - Gateway P5 Pentium 300 - Windows 95

Laptop - Dell Inspiron 700 Pentium II 300 - Windows NT 4.0 Service Pack 2

Silicon Graphics O2 180 MHZ IPC- IRIX 6.5.2

SUN Solaris 2.6 (SUNOS 5.6)

Gateway/Pentium - LINUX 2.2.13

The output results from SURF3.1 generated on the above stated machines were identical except for a few rounding variations in the tenths position. All the differences were less than or equal to 0.10, which is acceptable. The user may encounter slight differences in the output values due to the machine tolerances and to rounding.

4.0 TEST DESCRIPTIONS

4.1 Test Case 1

Test Case 1 executes the surf model with the following inputs:

(1) sea parameters (wave height, period, and direction)

(2) swell parameters (swell height, period, and direction)

(3) tide elevation

(4) sediment based equilibrium beach profile

The model is exercised with a coastline that is not parallel to the east-west or north-south axes and calculation of the Modified Surf Index includes wind effects on the longshore current. Although the longer period swell has a lower offshore height than the shorter period sea, the swell is the dominant wave contribution in the surf zone due to the shallow water effects. This test case does not exercise the wave refraction options.

The subroutines called during execution of Test Case 1 are:

b_detail	b_head	balanceq	c_fine	c_gamma	c_in_dep
c_regrid	c_un	calc_hb3	calcroll	calcsurf	depdrvr
f2	f3	genspec	get_brk	get_diss	get_m
get_p	get_rhs	get_wave	gridout	gt_p	gt_sig_h
initlize	integrat	klong	lin_1	lin_2	lin_3
long1	main_wav	mdsrf1	mdsrf2	new_brk	percent
prt_out1	prt_out3	pt2	rad_st1	rad_st2	rn2
s_coeff	s_nosurf	s_tide	seafit	setup	shortout
srfsetup	summary	surf	surfcast	swlfit	wavefit
wavenum	weightfn	zone1			

The input file includes several comments to help the user identify each input parameter. These comments are located on the right hand side of the input file. These comments are not recommended for execution, but are included to make the input files easily readable.

The Depth Profile input file, medsand.dep, is provided in Appendix C to avoid repeating the contents of this file for each case in which the file is used.

4.1.1 Test Case 1 Input File - Case1.in

```
case1.in                    Line 1  - Input Filename
1998102714                  Line 2  - Year Month Day
case 1 modified             Line 3  - Landing Zone Name
medsand.dep                 Line 4  - Input Depth Profile File Name
                            Line 5  - Input Wave Spectrum File Name
None                        Line 6  - Input Wave Refraction File Name
315                         Line 7  - Compass Heading Toward Beach
                            Line 8  - Sediment Type
-15                         Line 9  - Starting Depth
                            Line 10 - Offshore Wave Spectrum Depth
3 5 125 2 10 130            Line 11 - Sea and Swell Parameters
13 105 1                    Line 12 - Wind Speed, Wind Direction, Tide Elevation
5                           Line 13 - Output Data Grid Spacing
```

4.1.2 Test Case 1 Detailed Output File - Case1.out

```
      *****  *****  Surf Forecast  *****  *****
Navy Standard Surf Model     Version 3.1
Date and Time of Forecast:  10/27/1998   1400
Session Logged to file case1.out
Shallow Water Wave Refraction Only
Landing Zone Name                  = case 1 modified
Sight Line                  = 315.0 deg
Interval                    =   5.0 ft
Starting Depth              =  15.0 ft
Depth Profile File          =  medsand.dep
Sea   Height, Period, Direction =   3.0 ft,  5.0 sec, 125.0  deg
Swell Height, Period, Direction =   2.0 ft, 10.0 sec, 130.0  deg
Wind Speed                  =  13.0 kts
Wind Direction              = 105.0 deg
Tide Level                  =   1.0 ft
Internal grid spacing =  2.0 ft
Option : Internally Generated Spectrum Used
Significant Wave Height Offshore =    3.6 ft
Significant Wave Height =    3.6 ft
Peak Frequency =    0.10 Hz
Zero-Crossing Frequency =    0.22 Hz
Peak Period =    10.0 sec

    *****  *****  Coded Surf Forecast Follows  *****  *****
Significant Breaker Height                    alfa =    3.6 ft
Maximum Breaker Height                       bravo =    5.6 ft
Dominant Breaker Period                    charlie =   10.0 sec
Dominant Breaker Type                        delta = Spilling Surf
( 74% Spilling,  26% Plunging,   0% Surging)
Breaker Angle (toward left flank)             echo =    3.0 deg
Littoral Current (toward left flank)       foxtrot =    0.5 kts
Number of Surf Lines                         golf1 =    1.5
Surf Zone Width                              golf2 =  190.0 ft
Wind Speed                                  hotel1 =   13.0 kts
Wind Direction                              hotel2 =  105.0 deg
Modified Surf Index =      4.3

   *****  *****  Detailed Surf Output Follows  *****  *****
Indx   Dist    Water  Sig Brkr  Max Brkr  Prcnt  Wave   Littoral
     Offshore Depth   Height    Height    Brkng  Lngth  Current
       (ft)    (ft)    (ft)      (ft)     waves  (ft)    (kts)

  1   502.0     15.0    3.6       5.5      0.4    213.2   -0.13
  2   497.0     14.9    3.6       5.5      0.4    212.5   -0.14
  3   492.0     14.8    3.6       5.5      0.4    211.8   -0.14
  4   487.0     14.7    3.6       5.5      0.4    211.0   -0.14
  5   482.0     14.6    3.6       5.5      0.4    210.2   -0.14
  6   477.0     14.5    3.6       5.6      0.5    209.5   -0.14
  7   472.0     14.4    3.6       5.6      0.5    208.9   -0.14
  8   467.0     14.3    3.6       5.6      0.5    208.4   -0.14
  9   462.0     14.2    3.6       5.6      0.5    207.8   -0.14
 10   457.0     14.1    3.6       5.6      0.5    206.8   -0.15
 11   452.0     14.1    3.7       5.6      0.6    206.2   -0.15
 12   447.0     14.0    3.7       5.6      0.6    205.7   -0.15
 13   442.0     13.9    3.7       5.6      0.6    205.2   -0.15
 14   437.0     13.8    3.7       5.6      0.7    204.1   -0.15
 15   432.0     13.7    3.7       5.6      0.7    203.5   -0.15
```

16	427.0	13.6	3.7	5.6	0.7	202.9	-0.16
17	422.0	13.5	3.7	5.6	0.8	202.4	-0.16
18	417.0	13.4	3.7	5.6	0.8	201.2	-0.16
19	412.0	13.3	3.7	5.6	0.8	200.6	-0.16
20	407.0	13.2	3.7	5.6	0.9	200.1	-0.16
21	402.0	13.1	3.7	5.6	0.9	199.5	-0.17
22	397.0	13.0	3.7	5.7	1.0	198.3	-0.17
23	392.0	12.9	3.7	5.7	1.0	197.7	-0.17
24	387.0	12.8	3.7	5.7	1.1	197.2	-0.17
25	382.0	12.7	3.7	5.7	1.1	196.6	-0.18
26	377.0	12.6	3.7	5.7	1.2	195.3	-0.18
27	372.0	12.4	3.7	5.7	1.3	194.7	-0.18
28	367.0	12.3	3.7	5.7	1.3	194.1	-0.18
29	362.0	12.2	3.7	5.7	1.4	193.4	-0.19
30	357.0	12.1	3.7	5.7	1.5	192.2	-0.19
31	352.0	12.0	3.7	5.7	1.6	191.5	-0.19
32	347.0	11.9	3.7	5.7	1.6	190.9	-0.20
33	342.0	11.8	3.7	5.7	1.7	189.6	-0.20
34	337.0	11.7	3.7	5.7	1.8	189.0	-0.20
35	332.0	11.6	3.7	5.7	1.9	188.3	-0.21
36	327.0	11.5	3.7	5.7	2.0	187.6	-0.21
37	322.0	11.4	3.7	5.7	2.2	186.2	-0.21
38	317.0	11.3	3.7	5.7	2.3	185.5	-0.22
39	312.0	11.2	3.8	5.7	2.4	184.8	-0.22
40	307.0	11.1	3.8	5.7	2.6	184.1	-0.23
41	302.0	10.9	3.8	5.7	2.7	182.7	-0.23
42	297.0	10.8	3.8	5.7	2.9	182.0	-0.23
43	292.0	10.7	3.8	5.7	3.0	181.3	-0.24
44	287.0	10.6	3.8	5.7	3.2	180.5	-0.24
45	282.0	10.5	3.8	5.7	3.4	179.4	-0.25
46	277.0	10.4	3.8	5.7	3.6	178.3	-0.25
47	272.0	10.3	3.8	5.7	3.9	177.1	-0.26
48	267.0	10.1	3.8	5.7	4.1	176.3	-0.26
49	262.0	10.0	3.8	5.7	4.4	175.2	-0.27
50	257.0	9.9	3.7	5.7	4.6	174.4	-0.27
51	252.0	9.8	3.7	5.7	4.9	173.2	-0.28
52	247.0	9.7	3.7	5.7	5.2	172.4	-0.28
53	242.0	9.6	3.7	5.7	5.5	171.1	-0.29
54	237.0	9.4	3.7	5.7	5.9	170.3	-0.29
55	232.0	9.3	3.7	5.7	6.2	169.0	-0.30
56	227.0	9.2	3.7	5.7	6.6	168.1	-0.31
57	222.0	9.1	3.7	5.7	7.1	166.9	-0.31
58	217.0	9.0	3.7	5.7	7.5	166.0	-0.32
59	212.0	8.8	3.7	5.6	7.9	164.6	-0.32
60	207.0	8.7	3.7	5.6	8.5	163.7	-0.33
61	202.0	8.6	3.7	5.6	9.0	162.3	-0.34
62	197.0	8.4	3.7	5.6	9.5	161.4	-0.34
63	192.0	8.3	3.6	5.6	10.1	160.0	-0.35
64	187.0	8.2	3.6	5.5	10.7	159.0	-0.35
65	182.0	8.1	3.6	5.5	11.4	157.6	-0.36
66	177.0	7.9	3.6	5.5	12.1	156.5	-0.37
67	172.0	7.8	3.6	5.5	12.9	155.0	-0.37
68	167.0	7.7	3.5	5.4	13.7	154.0	-0.38
69	162.0	7.5	3.5	5.4	14.5	151.8	-0.39
70	157.0	7.4	3.5	5.3	15.4	150.7	-0.39
71	152.0	7.2	3.5	5.3	16.4	149.1	-0.40
72	147.0	7.1	3.4	5.3	17.3	148.0	-0.40
73	142.0	7.0	3.4	5.2	18.4	146.2	-0.41
74	137.0	6.8	3.4	5.2	19.6	145.1	-0.42

75	132.0	6.7	3.3	5.1	20.8	143.2	-0.42
76	127.0	6.5	3.3	5.1	22.1	142.0	-0.43
77	122.0	6.4	3.3	5.0	23.5	140.8	-0.43
78	117.0	6.2	3.2	4.8	24.9	139.5	-0.44
79	112.0	6.1	3.2	4.7	26.5	137.5	-0.44
80	107.0	5.9	3.1	4.6	28.2	136.2	-0.45
81	102.0	5.7	3.1	4.5	30.1	134.1	-0.45
82	97.0	5.6	3.0	4.3	32.0	132.7	-0.46
83	92.0	5.4	3.0	4.2	34.1	130.5	-0.46
84	87.0	5.2	2.9	4.1	36.6	128.9	-0.46
85	82.0	5.1	2.9	4.0	39.2	126.6	-0.46
86	77.0	4.9	2.8	3.8	42.1	125.0	-0.46
87	72.0	4.7	2.8	3.7	45.3	122.4	-0.46
88	67.0	4.5	2.7	3.5	49.0	120.6	-0.46
89	62.0	4.3	2.6	3.4	53.1	117.8	-0.46
90	57.0	4.1	2.5	3.2	57.2	115.9	-0.46
91	52.0	3.9	2.5	3.1	61.6	112.8	-0.45
92	47.0	3.7	2.4	2.9	66.6	110.6	-0.44
93	42.0	3.5	2.3	2.7	71.9	107.0	-0.44
94	37.0	3.3	2.3	2.6	77.4	104.4	-0.42
95	32.0	3.0	2.2	2.4	82.8	100.2	-0.41
96	27.0	2.8	2.1	2.2	87.7	97.1	-0.39
97	22.0	2.5	2.0	2.0	92.1	91.6	-0.37
98	17.0	2.2	1.7	1.7	95.6	87.6	-0.34
99	12.0	1.8	1.4	1.4	98.3	77.7	-0.31
100	7.0	1.3	1.0	1.0	99.7	69.2	-0.25

4.1.3 Test Case 1 Summary Output File – Case1.dat

1	502.0	15.0	3.6	5.5	0.4	213.2	-0.13
2	497.0	14.9	3.6	5.5	0.4	212.5	-0.14
3	492.0	14.8	3.6	5.5	0.4	211.8	-0.14
4	487.0	14.7	3.6	5.5	0.4	211.0	-0.14
5	482.0	14.6	3.6	5.5	0.4	210.2	-0.14
6	477.0	14.5	3.6	5.6	0.5	209.5	-0.14
7	472.0	14.4	3.6	5.6	0.5	208.9	-0.14
8	467.0	14.3	3.6	5.6	0.5	208.4	-0.14
9	462.0	14.2	3.6	5.6	0.5	207.8	-0.14
10	457.0	14.1	3.6	5.6	0.5	206.8	-0.15
11	452.0	14.1	3.7	5.6	0.6	206.2	-0.15
12	447.0	14.0	3.7	5.6	0.6	205.7	-0.15
13	442.0	13.9	3.7	5.6	0.6	205.2	-0.15
14	437.0	13.8	3.7	5.6	0.7	204.1	-0.15
15	432.0	13.7	3.7	5.6	0.7	203.5	-0.15
16	427.0	13.6	3.7	5.6	0.7	202.9	-0.16
17	422.0	13.5	3.7	5.6	0.8	202.4	-0.16
18	417.0	13.4	3.7	5.6	0.8	201.2	-0.16
19	412.0	13.3	3.7	5.6	0.8	200.6	-0.16
20	407.0	13.2	3.7	5.6	0.9	200.1	-0.16
21	402.0	13.1	3.7	5.6	0.9	199.5	-0.17
22	397.0	13.0	3.7	5.7	1.0	198.3	-0.17
23	392.0	12.9	3.7	5.7	1.0	197.7	-0.17
24	387.0	12.8	3.7	5.7	1.1	197.2	-0.17
25	382.0	12.7	3.7	5.7	1.1	196.6	-0.18
26	377.0	12.6	3.7	5.7	1.2	195.3	-0.18
27	372.0	12.4	3.7	5.7	1.3	194.7	-0.18
28	367.0	12.3	3.7	5.7	1.3	194.1	-0.18
29	362.0	12.2	3.7	5.7	1.4	193.4	-0.19
30	357.0	12.1	3.7	5.7	1.5	192.2	-0.19
31	352.0	12.0	3.7	5.7	1.6	191.5	-0.19
32	347.0	11.9	3.7	5.7	1.6	190.9	-0.20
33	342.0	11.8	3.7	5.7	1.7	189.6	-0.20
34	337.0	11.7	3.7	5.7	1.8	189.0	-0.20
35	332.0	11.6	3.7	5.7	1.9	188.3	-0.21
36	327.0	11.5	3.7	5.7	2.0	187.6	-0.21
37	322.0	11.4	3.7	5.7	2.2	186.2	-0.21
38	317.0	11.3	3.7	5.7	2.3	185.5	-0.22
39	312.0	11.2	3.8	5.7	2.4	184.8	-0.22
40	307.0	11.1	3.8	5.7	2.6	184.1	-0.23
41	302.0	10.9	3.8	5.7	2.7	182.7	-0.23
42	297.0	10.8	3.8	5.7	2.9	182.0	-0.23
43	292.0	10.7	3.8	5.7	3.0	181.3	-0.24
44	287.0	10.6	3.8	5.7	3.2	180.5	-0.24
45	282.0	10.5	3.8	5.7	3.4	179.4	-0.25
46	277.0	10.4	3.8	5.7	3.6	178.3	-0.25
47	272.0	10.3	3.8	5.7	3.9	177.1	-0.26
48	267.0	10.1	3.8	5.7	4.1	176.3	-0.26
49	262.0	10.0	3.8	5.7	4.4	175.2	-0.27
50	257.0	9.9	3.7	5.7	4.6	174.4	-0.27
51	252.0	9.8	3.7	5.7	4.9	173.2	-0.28
52	247.0	9.7	3.7	5.7	5.2	172.4	-0.28
53	242.0	9.6	3.7	5.7	5.5	171.1	-0.29
54	237.0	9.4	3.7	5.7	5.9	170.3	-0.29
55	232.0	9.3	3.7	5.7	6.2	169.0	-0.30
56	227.0	9.2	3.7	5.7	6.6	168.1	-0.31
57	222.0	9.1	3.7	5.7	7.1	166.9	-0.31

58	217.0	9.0	3.7	5.7	7.5	166.0	-0.32
59	212.0	8.8	3.7	5.6	7.9	164.6	-0.32
60	207.0	8.7	3.7	5.6	8.5	163.7	-0.33
61	202.0	8.6	3.7	5.6	9.0	162.3	-0.34
62	197.0	8.4	3.7	5.6	9.5	161.4	-0.34
63	192.0	8.3	3.6	5.6	10.1	160.0	-0.35
64	187.0	8.2	3.6	5.5	10.7	159.0	-0.35
65	182.0	8.1	3.6	5.5	11.4	157.6	-0.36
66	177.0	7.9	3.6	5.5	12.1	156.5	-0.37
67	172.0	7.8	3.6	5.5	12.9	155.0	-0.37
68	167.0	7.7	3.5	5.4	13.7	154.0	-0.38
69	162.0	7.5	3.5	5.4	14.5	151.8	-0.39
70	157.0	7.4	3.5	5.3	15.4	150.7	-0.39
71	152.0	7.2	3.5	5.3	16.4	149.1	-0.40
72	147.0	7.1	3.4	5.3	17.3	148.0	-0.40
73	142.0	7.0	3.4	5.2	18.4	146.2	-0.41
74	137.0	6.8	3.4	5.2	19.6	145.1	-0.42
75	132.0	6.7	3.3	5.1	20.8	143.2	-0.42
76	127.0	6.5	3.3	5.1	22.1	142.0	-0.43
77	122.0	6.4	3.3	5.0	23.5	140.8	-0.43
78	117.0	6.2	3.2	4.8	24.9	139.5	-0.44
79	112.0	6.1	3.2	4.7	26.5	137.5	-0.44
80	107.0	5.9	3.1	4.6	28.2	136.2	-0.45
81	102.0	5.7	3.1	4.5	30.1	134.1	-0.45
82	97.0	5.6	3.0	4.3	32.0	132.7	-0.46
83	92.0	5.4	3.0	4.2	34.1	130.5	-0.46
84	87.0	5.2	2.9	4.1	36.6	128.9	-0.46
85	82.0	5.1	2.9	4.0	39.2	126.6	-0.46
86	77.0	4.9	2.8	3.8	42.1	125.0	-0.46
87	72.0	4.7	2.8	3.7	45.3	122.4	-0.46
88	67.0	4.5	2.7	3.5	49.0	120.6	-0.46
89	62.0	4.3	2.6	3.4	53.1	117.8	-0.46
90	57.0	4.1	2.5	3.2	57.2	115.9	-0.46
91	52.0	3.9	2.5	3.1	61.6	112.8	-0.45
92	47.0	3.7	2.4	2.9	66.6	110.6	-0.44
93	42.0	3.5	2.3	2.7	71.9	107.0	-0.44
94	37.0	3.3	2.3	2.6	77.4	104.4	-0.42
95	32.0	3.0	2.2	2.4	82.8	100.2	-0.41
96	27.0	2.8	2.1	2.2	87.7	97.1	-0.39
97	22.0	2.5	2.0	2.0	92.1	91.6	-0.37
98	17.0	2.2	1.7	1.7	95.6	87.6	-0.34
99	12.0	1.8	1.4	1.4	98.3	77.7	-0.31
100	7.0	1.3	1.0	1.0	99.7	69.2	-0.25

4.2 Test Case 2

Test Case 2 executes the surf model with the following inputs:

(1) sea parameters (wave height, period, and direction)
(2) swell parameters (swell height, period, and direction)
(3) tide elevation
(4) internal sediment type equilibrium beach profile

This test case is similar to Test Case 1, but the self start option is used. This option shoals the waves from offshore to a location where 5% of the waves are breaking. Selecting this option decreases the model run time and the amount of output data. This case does not use an input depth file, but internally constructs a type 7 medium sand profile. Although the longer period swell has a lower offshore height than the shorter period sea, the swell is the dominant wave contribution in the surf zone due to the shallow water effects. This test case does not exercise the wave refraction options.

The subroutines called during execution of Test Case 2 are:

b_detail	b_head	balanceq	c_fine	c_gamma	c_in_dep
c_regrid	c_un	calc_hb3	calcroll	calcsurf	depdrvr
equilprf	f2	f3	genspec	get_brk	get_diss
get_m	get_p	get_rhs	get_wave	gridout	gt_p
gt_sig_h	initlize	integrat	klong	lin_1	lin_2
lin_3	long1	main_wav	mdsrf1	mdsrf2	new_brk
percent	prt_out1	prt_out3	pt2	rad_st1	rad_st2
rn2	s_coeff	s_nosurf	s_tide	seafit	setup
shortout	slf_strt	srfsetup	summary	surf	surfcast
swlfit	wavefit	wavenum	weightfn	zone1	

4.2.1 Test Case 2 Input File - Case2.in

```
case2.in                Line 1  - Input Filename
1998102714              Line 2  - Year Month Day
case 2 modified         Line 3  - Landing Zone Name
                        Line 4  - Input Depth Profile File Name
                        Line 5  - Input Wave Spectrum File Name
None                    Line 6  - Input Wave Refraction File Name
315                     Line 7  - Compass Heading Toward Beach
7                       Line 8  - Sediment Type
15                      Line 9  - Starting Depth
9999                    Line 10 - Offshore Wave Spectrum Depth
3 5 125 2 10 130        Line 11 - Sea and Swell Parameters
13 105 1                Line 12 - Wind Speed, Wind Direction, Tide Elevation
5                       Line 13 - Output Data Grid Spacing
```

4.2.2 Test Case 2 Detailed Output File - Case2.out

```
      *****  *****  Surf Forecast  *****  *****
Navy Standard Surf Model     Version 3.1
Date and Time of Forecast:  10/27/1998   1400
Session Logged to file case2.out
Shallow Water Wave Refraction Only
Landing Zone Name                  = case 2 modified
Sight Line                  = 315.0 deg
Interval                    =   5.0 ft
Starting Depth              =  15.0 ft
Equilibrium Beach Sediment = medium sand
Sea   Height, Period, Direction =   3.0 ft,  5.0 sec, 125.0  deg
Swell Height, Period, Direction =   2.0 ft, 10.0 sec, 130.0  deg
Wind Speed                  =  13.0 kts
Wind Direction              = 105.0 deg
Tide Level                  =   1.0 ft
Internal grid spacing =  2.0 ft
Option : Internally Generated Spectrum Used
Significant Wave Height Offshore =     3.6 ft
Significant Wave Height =     3.6 ft
Peak Frequency =     0.10 Hz
Zero-Crossing Frequency =     0.22 Hz
Peak Period =     10.0 sec
Percent of Breaking Waves is less than  5.0 %  at starting depth.
Self Starting option was selected.

     *****  *****  Coded Surf Forecast Follows  *****  *****
Significant Breaker Height                      alfa =    3.8 ft
Maximum Breaker Height                         bravo =    5.8 ft
Dominant Breaker Period                      charlie =   10.0 sec
Dominant Breaker Type                          delta = Spilling Surf
( 81% Spilling,  19% Plunging,    0% Surging)
Breaker Angle (toward left flank)               echo =    3.0 deg
Littoral Current (toward left flank)         foxtrot =    0.4 kts
Number of Surf Lines                           golf1 =    1.5
Surf Zone Width                                golf2 =  198.0 ft
Wind Speed                                    hotel1 =   13.0 kts
Wind Direction                                hotel2 =  105.0 deg
Modified Surf Index =      4.1

    *****  *****  Detailed Surf Output Follows  *****  *****
 Indx   Dist    Water  Sig Brkr  Max Brkr  Prcnt  Wave   Littoral
      Offshore Depth   Height    Height    Brkng  Lngth  Current
        (ft)    (ft)    (ft)      (ft)     waves  (ft)    (kts)

   1   266.8     10.2    3.9       6.0      5.0   177.5   -0.13
   2   261.8     10.1    3.9       6.0      5.3   175.9   -0.14
   3   256.8     10.0    3.9       6.0      5.6   175.1   -0.16
   4   251.8      9.9    3.9       6.0      5.9   174.0   -0.17
   5   246.8      9.8    3.9       6.0      6.3   173.2   -0.18
   6   241.8      9.6    3.9       6.0      6.6   171.9   -0.19
   7   236.8      9.5    3.9       5.9      7.0   171.1   -0.20
   8   231.8      9.4    3.9       5.9      7.4   169.9   -0.21
   9   226.8      9.3    3.9       5.9      7.8   169.0   -0.21
  10   221.8      9.1    3.9       5.9      8.3   167.7   -0.22
  11   216.8      9.0    3.8       5.9      8.7   166.9   -0.23
  12   211.8      8.9    3.8       5.9      9.2   165.5   -0.24
  13   206.8      8.8    3.8       5.8      9.8   164.6   -0.25
```

14	201.8	8.6	3.8	5.8	10.3	163.3	-0.26
15	196.8	8.5	3.8	5.8	10.9	162.4	-0.27
16	191.8	8.4	3.8	5.8	11.5	161.0	-0.28
17	186.8	8.3	3.7	5.7	12.1	160.0	-0.29
18	181.8	8.1	3.7	5.7	12.8	158.6	-0.30
19	176.8	8.0	3.7	5.7	13.5	157.6	-0.31
20	171.8	7.9	3.7	5.6	14.3	155.6	-0.32
21	166.8	7.7	3.6	5.6	15.1	154.5	-0.33
22	161.8	7.6	3.6	5.5	15.9	153.0	-0.34
23	156.8	7.5	3.6	5.5	16.8	151.9	-0.35
24	151.8	7.3	3.6	5.5	17.8	150.3	-0.35
25	146.8	7.2	3.5	5.4	18.8	149.2	-0.36
26	141.8	7.0	3.5	5.4	19.8	147.5	-0.37
27	136.8	6.9	3.5	5.3	21.0	146.4	-0.38
28	131.8	6.7	3.4	5.2	22.1	145.2	-0.39
29	126.8	6.6	3.4	5.1	23.4	144.0	-0.39
30	121.8	6.5	3.3	5.0	24.8	142.2	-0.40
31	116.8	6.3	3.3	4.9	26.2	140.9	-0.41
32	111.8	6.1	3.3	4.8	27.7	139.0	-0.41
33	106.8	6.0	3.2	4.7	29.4	137.7	-0.42
34	101.8	5.8	3.2	4.5	31.1	135.7	-0.42
35	96.8	5.7	3.1	4.4	33.1	134.3	-0.43
36	91.8	5.5	3.1	4.3	35.2	132.1	-0.43
37	86.8	5.3	3.0	4.2	37.4	130.6	-0.44
38	81.8	5.2	2.9	4.0	40.0	128.4	-0.44
39	76.8	5.0	2.9	3.9	42.7	126.8	-0.44
40	71.8	4.8	2.8	3.8	45.9	124.3	-0.44
41	66.8	4.6	2.8	3.6	49.3	122.6	-0.44
42	61.8	4.5	2.7	3.5	53.2	119.9	-0.44
43	56.8	4.3	2.6	3.3	57.1	118.1	-0.44
44	51.8	4.1	2.5	3.2	61.1	115.1	-0.44
45	46.8	3.9	2.5	3.0	65.6	113.0	-0.43
46	41.8	3.6	2.4	2.8	70.5	109.7	-0.42
47	36.8	3.4	2.3	2.7	75.6	107.3	-0.41
48	31.8	3.2	2.3	2.5	80.7	103.4	-0.40
49	26.8	3.0	2.2	2.3	85.6	100.6	-0.38
50	21.8	2.7	2.1	2.1	90.0	95.9	-0.36
51	16.8	2.4	1.9	1.9	93.8	92.3	-0.34
52	11.8	2.1	1.6	1.6	96.7	85.9	-0.31
53	6.8	1.7	1.4	1.4	98.7	80.5	-0.27

4.2.3 Test Case 2 Summary Output File – Case2.dat

1	266.8	10.2	3.9	6.0	5.0	177.5	-0.13
2	261.8	10.1	3.9	6.0	5.3	175.9	-0.14
3	256.8	10.0	3.9	6.0	5.6	175.1	-0.16
4	251.8	9.9	3.9	6.0	5.9	174.0	-0.17
5	246.8	9.8	3.9	6.0	6.3	173.2	-0.18
6	241.8	9.6	3.9	6.0	6.6	171.9	-0.19
7	236.8	9.5	3.9	5.9	7.0	171.1	-0.20
8	231.8	9.4	3.9	5.9	7.4	169.9	-0.21
9	226.8	9.3	3.9	5.9	7.8	169.0	-0.21
10	221.8	9.1	3.9	5.9	8.3	167.7	-0.22
11	216.8	9.0	3.8	5.9	8.7	166.9	-0.23
12	211.8	8.9	3.8	5.9	9.2	165.5	-0.24
13	206.8	8.8	3.8	5.8	9.8	164.6	-0.25
14	201.8	8.6	3.8	5.8	10.3	163.3	-0.26
15	196.8	8.5	3.8	5.8	10.9	162.4	-0.27
16	191.8	8.4	3.8	5.8	11.5	161.0	-0.28
17	186.8	8.3	3.7	5.7	12.1	160.0	-0.29
18	181.8	8.1	3.7	5.7	12.8	158.6	-0.30
19	176.8	8.0	3.7	5.7	13.5	157.6	-0.31
20	171.8	7.9	3.7	5.6	14.3	155.6	-0.32
21	166.8	7.7	3.6	5.6	15.1	154.5	-0.33
22	161.8	7.6	3.6	5.5	15.9	153.0	-0.34
23	156.8	7.5	3.6	5.5	16.8	151.9	-0.35
24	151.8	7.3	3.6	5.5	17.8	150.3	-0.35
25	146.8	7.2	3.5	5.4	18.8	149.2	-0.36
26	141.8	7.0	3.5	5.4	19.8	147.5	-0.37
27	136.8	6.9	3.5	5.3	21.0	146.4	-0.38
28	131.8	6.7	3.4	5.2	22.1	145.2	-0.39
29	126.8	6.6	3.4	5.1	23.4	144.0	-0.39
30	121.8	6.5	3.3	5.0	24.8	142.2	-0.40
31	116.8	6.3	3.3	4.9	26.2	140.9	-0.41
32	111.8	6.1	3.3	4.8	27.7	139.0	-0.41
33	106.8	6.0	3.2	4.7	29.4	137.7	-0.42
34	101.8	5.8	3.2	4.5	31.1	135.7	-0.42
35	96.8	5.7	3.1	4.4	33.1	134.3	-0.43
36	91.8	5.5	3.1	4.3	35.2	132.1	-0.43
37	86.8	5.3	3.0	4.2	37.4	130.6	-0.44
38	81.8	5.2	2.9	4.0	40.0	128.4	-0.44
39	76.8	5.0	2.9	3.9	42.7	126.8	-0.44
40	71.8	4.8	2.8	3.8	45.9	124.3	-0.44
41	66.8	4.6	2.8	3.6	49.3	122.6	-0.44
42	61.8	4.5	2.7	3.5	53.2	119.9	-0.44
43	56.8	4.3	2.6	3.3	57.1	118.1	-0.44
44	51.8	4.1	2.5	3.2	61.1	115.1	-0.44
45	46.8	3.9	2.5	3.0	65.6	113.0	-0.43
46	41.8	3.6	2.4	2.8	70.5	109.7	-0.42
47	36.8	3.4	2.3	2.7	75.6	107.3	-0.41
48	31.8	3.2	2.3	2.5	80.7	103.4	-0.40
49	26.8	3.0	2.2	2.3	85.6	100.6	-0.38
50	21.8	2.7	2.1	2.1	90.0	95.9	-0.36
51	16.8	2.4	1.9	1.9	93.8	92.3	-0.34
52	11.8	2.1	1.6	1.6	96.7	85.9	-0.31
53	6.8	1.7	1.4	1.4	98.7	80.5	-0.27

4.3 Test Case 3

Test Case 3 tests the surf model in the same manner as Test Case 2 but with an external depth file (medsand.dep). Input wave directions are oriented so the longshore currents are in the opposite direction and a zero tide elevation is applied to the specified depth profile.

Algorithms that consider wave direction, beach orientation and modified water depths for tide elevations are tested. The change in longshore current direction is indicated by a sign change in the littoral current velocity in the detailed output and a flank reversal in the coded surf forecast compared to Test Case 2. Because of the lower tide elevation in Test Case 3, the apparent depth profile is less steep which results in slightly more spilling breakers and a larger surf zone width than in Test Case 2.

The subroutines called during execution of Test Case 3 are:

b_detail	b_head	balanceq	c_fine	c_gamma	c_in_dep
c_regrid	c_un	calc_hb3	calcroll	calcsurf	depdrvr
f2	f3	genspec	get_brk	get_diss	get_m
get_p	get_rhs	get_wave	gridout	gt_p	gt_sig_h
initlize	integrat	klong	lin_1	lin_2	lin_3
long1	main_wav	mdsrf1	mdsrf2	new_brk	percent
prt_out1	prt_out3	pt2	rad_st1	rad_st2	rn2
s_coeff	s_nosurf	s_tide	seafit	setup	shortout
slf_strt	srfsetup	summary	surf	surfcast	swlfit
wavefit	wavenum	weightfn	zone1		

The Depth Profile input file (medsand.dep) is provided in Appendix C to avoid repeating the contents of this file for each test case.

4.3.1 Test Case 3 Input File - Case3.in

```
case3.in                    Line 1  - Input Filename
1998102714                  Line 2  - Year Month Day
case 3 modified             Line 3  - Landing Zone Name
medsand.dep                 Line 4  - Input Depth Profile File Name
                            Line 5  - Input Wave Spectrum File Name
None                        Line 6  - Input Wave Refraction File Name
315                         Line 7  - Compass Heading Toward Beach
                            Line 8  - Sediment Type
15                          Line 9  - Starting Depth
                            Line 10 - Offshore Wave Spectrum Depth
3 5 145 2 10 140            Line 11 - Sea and Swell Parameters
13 165 0                    Line 12 - Wind Speed, Wind Direction, Tide Elevation
5                           Line 13 - Output Data Grid Spacing
```

4.3.2 Test Case 3 Detailed Output File - Case3.out

```
      *****  *****  Surf Forecast  *****  *****
Navy Standard Surf Model     Version 3.1
Date and Time of Forecast:  10/27/1998   1400
Session Logged to file case3.out
Shallow Water Wave Refraction Only
Landing Zone Name                 = case 3 modified
Sight Line                  = 315.0 deg
Interval                    =   5.0 ft
Starting Depth              =  15.0 ft
Depth Profile File          =  medsand.dep
Sea   Height, Period, Direction =   3.0 ft,  5.0 sec, 145.0  deg
Swell Height, Period, Direction =   2.0 ft, 10.0 sec, 140.0  deg
Wind Speed                  =  13.0 kts
Wind Direction              = 165.0 deg
Tide Level                  =   0.0 ft
Internal grid spacing =  2.0 ft
Option : Internally Generated Spectrum Used
Significant Wave Height Offshore =    3.6 ft
Significant Wave Height =    3.6 ft
Peak Frequency =    0.10 Hz
Zero-Crossing Frequency =    0.22 Hz
Peak Period =    10.0 sec
Percent of Breaking Waves is less than  5.0 %  at starting depth.
Self Starting option was selected.

    *****  *****  Coded Surf Forecast Follows  *****  *****
 Significant Breaker Height                    alfa =    3.8 ft
 Maximum Breaker Height                       bravo =    5.8 ft
 Dominant Breaker Period                    charlie =   10.0 sec
 Dominant Breaker Type                        delta = Spilling Surf
 ( 85% Spilling,  15% Plunging,   0% Surging)
 Breaker Angle (toward right flank)            echo =    3.0 deg
 Littoral Current (toward right flank)      foxtrot =    0.5 kts
 Number of Surf Lines                         golf1 =    1.8
 Surf Zone Width                              golf2 =  234.0 ft
 Wind Speed                                  hotel1 =   13.0 kts
 Wind Direction                              hotel2 =  165.0 deg
 Modified Surf Index =      4.0

   *****  *****  Detailed Surf Output Follows  *****  *****
 Indx   Dist    Water  Sig Brkr  Max Brkr  Prcnt  Wave   Littoral
      Offshore Depth   Height    Height    Brkng  Lngth  Current
        (ft)    (ft)    (ft)      (ft)     waves  (ft)   (kts)

   1   304.0     10.1    3.9       5.9      5.1   176.3    0.13
   2   299.0     10.0    3.9       5.9      5.4   175.2    0.15
   3   294.0      9.9    3.9       5.9      5.7   173.7    0.16
   4   289.0      9.7    3.9       5.9      6.0   172.9    0.17
   5   284.0      9.6    3.9       5.9      6.3   171.7    0.18
   6   279.0      9.5    3.9       5.9      6.7   171.0    0.19
   7   274.0      9.4    3.8       5.9      7.0   169.8    0.20
   8   269.0      9.3    3.8       5.9      7.4   169.0    0.21
   9   264.0      9.2    3.8       5.8      7.8   167.8    0.22
  10   259.0      9.1    3.8       5.8      8.2   166.9    0.23
  11   254.0      8.9    3.8       5.8      8.7   165.7    0.24
  12   249.0      8.8    3.8       5.8      9.1   164.9    0.25
  13   244.0      8.7    3.8       5.8      9.6   163.6    0.26
```

14	239.0	8.6	3.8	5.7	10.1	162.7	0.27
15	234.0	8.5	3.7	5.7	10.7	161.4	0.28
16	229.0	8.3	3.7	5.7	11.2	160.5	0.29
17	224.0	8.2	3.7	5.7	11.8	159.1	0.30
18	219.0	8.1	3.7	5.6	12.4	158.2	0.30
19	214.0	8.0	3.7	5.6	13.1	156.9	0.31
20	209.0	7.9	3.6	5.6	13.7	156.0	0.32
21	204.0	7.7	3.6	5.5	14.5	154.0	0.33
22	199.0	7.6	3.6	5.5	15.2	153.0	0.34
23	194.0	7.5	3.6	5.5	16.0	151.6	0.35
24	189.0	7.3	3.5	5.4	16.8	150.6	0.36
25	184.0	7.2	3.5	5.4	17.7	149.1	0.37
26	179.0	7.1	3.5	5.3	18.6	148.0	0.38
27	174.0	6.9	3.4	5.3	19.6	146.4	0.39
28	169.0	6.8	3.4	5.2	20.6	145.3	0.39
29	164.0	6.7	3.4	5.2	21.7	144.2	0.40
30	159.0	6.5	3.3	5.1	22.8	143.1	0.41
31	154.0	6.4	3.3	5.0	24.0	141.4	0.42
32	149.0	6.3	3.3	4.9	25.2	140.2	0.42
33	144.0	6.1	3.2	4.8	26.5	138.5	0.43
34	139.0	6.0	3.2	4.7	27.9	137.3	0.44
35	134.0	5.8	3.1	4.6	29.4	135.4	0.44
36	129.0	5.7	3.1	4.4	31.0	134.1	0.45
37	124.0	5.5	3.0	4.3	32.8	132.2	0.45
38	119.0	5.4	3.0	4.2	34.6	130.8	0.46
39	114.0	5.2	2.9	4.1	36.5	128.8	0.46
40	109.0	5.1	2.9	4.0	38.6	127.4	0.47
41	104.0	4.9	2.8	3.8	41.1	125.2	0.47
42	99.0	4.8	2.8	3.7	43.7	123.7	0.47
43	94.0	4.6	2.7	3.6	46.4	121.5	0.47
44	89.0	4.4	2.6	3.5	49.4	119.9	0.47
45	84.0	4.3	2.6	3.3	52.9	117.4	0.47
46	79.0	4.1	2.5	3.2	56.3	115.7	0.47
47	74.0	3.9	2.4	3.1	59.8	113.0	0.46
48	69.0	3.8	2.4	2.9	63.3	111.2	0.46
49	64.0	3.6	2.3	2.8	67.3	108.3	0.45
50	59.0	3.4	2.2	2.6	71.5	106.2	0.44
51	54.0	3.2	2.2	2.5	75.8	102.9	0.43
52	49.0	3.0	2.1	2.3	80.0	100.6	0.41
53	44.0	2.8	2.0	2.2	84.3	96.9	0.40
54	39.0	2.6	2.0	2.0	88.2	94.2	0.38
55	34.0	2.3	1.8	1.8	91.7	89.7	0.36
56	29.0	2.1	1.6	1.6	94.6	86.5	0.33
57	24.0	1.8	1.4	1.4	96.9	81.1	0.30
58	19.0	1.6	1.2	1.2	98.4	76.9	0.27
59	14.0	1.3	1.0	1.0	99.5	69.6	0.22
60	9.0	0.9	0.7	0.7	99.9	62.2	0.17

4.3.3 Test Case 3 Summary Output File – Case3.dat

1	304.0	10.1	3.9	5.9	5.1	176.3	0.13
2	299.0	10.0	3.9	5.9	5.4	175.2	0.15
3	294.0	9.9	3.9	5.9	5.7	173.7	0.16
4	289.0	9.7	3.9	5.9	6.0	172.9	0.17
5	284.0	9.6	3.9	5.9	6.3	171.7	0.18
6	279.0	9.5	3.9	5.9	6.7	171.0	0.19
7	274.0	9.4	3.8	5.9	7.0	169.8	0.20
8	269.0	9.3	3.8	5.9	7.4	169.0	0.21
9	264.0	9.2	3.8	5.8	7.8	167.8	0.22
10	259.0	9.1	3.8	5.8	8.2	166.9	0.23
11	254.0	8.9	3.8	5.8	8.7	165.7	0.24
12	249.0	8.8	3.8	5.8	9.1	164.9	0.25
13	244.0	8.7	3.8	5.8	9.6	163.6	0.26
14	239.0	8.6	3.8	5.7	10.1	162.7	0.27
15	234.0	8.5	3.7	5.7	10.7	161.4	0.28
16	229.0	8.3	3.7	5.7	11.2	160.5	0.29
17	224.0	8.2	3.7	5.7	11.8	159.1	0.30
18	219.0	8.1	3.7	5.6	12.4	158.2	0.30
19	214.0	8.0	3.7	5.6	13.1	156.9	0.31
20	209.0	7.9	3.6	5.6	13.7	156.0	0.32
21	204.0	7.7	3.6	5.5	14.5	154.0	0.33
22	199.0	7.6	3.6	5.5	15.2	153.0	0.34
23	194.0	7.5	3.6	5.5	16.0	151.6	0.35
24	189.0	7.3	3.5	5.4	16.8	150.6	0.36
25	184.0	7.2	3.5	5.4	17.7	149.1	0.37
26	179.0	7.1	3.5	5.3	18.6	148.0	0.38
27	174.0	6.9	3.4	5.3	19.6	146.4	0.39
28	169.0	6.8	3.4	5.2	20.6	145.3	0.39
29	164.0	6.7	3.4	5.2	21.7	144.2	0.40
30	159.0	6.5	3.3	5.1	22.8	143.1	0.41
31	154.0	6.4	3.3	5.0	24.0	141.4	0.42
32	149.0	6.3	3.3	4.9	25.2	140.2	0.42
33	144.0	6.1	3.2	4.8	26.5	138.5	0.43
34	139.0	6.0	3.2	4.7	27.9	137.3	0.44
35	134.0	5.8	3.1	4.6	29.4	135.4	0.44
36	129.0	5.7	3.1	4.4	31.0	134.1	0.45
37	124.0	5.5	3.0	4.3	32.8	132.2	0.45
38	119.0	5.4	3.0	4.2	34.6	130.8	0.46
39	114.0	5.2	2.9	4.1	36.5	128.8	0.46
40	109.0	5.1	2.9	4.0	38.6	127.4	0.47
41	104.0	4.9	2.8	3.8	41.1	125.2	0.47
42	99.0	4.8	2.8	3.7	43.7	123.7	0.47
43	94.0	4.6	2.7	3.6	46.4	121.5	0.47
44	89.0	4.4	2.6	3.5	49.4	119.9	0.47
45	84.0	4.3	2.6	3.3	52.9	117.4	0.47
46	79.0	4.1	2.5	3.2	56.3	115.7	0.47
47	74.0	3.9	2.4	3.1	59.8	113.0	0.46
48	69.0	3.8	2.4	2.9	63.3	111.2	0.46
49	64.0	3.6	2.3	2.8	67.3	108.3	0.45
50	59.0	3.4	2.2	2.6	71.5	106.2	0.44
51	54.0	3.2	2.2	2.5	75.8	102.9	0.43
52	49.0	3.0	2.1	2.3	80.0	100.6	0.41
53	44.0	2.8	2.0	2.2	84.3	96.9	0.40
54	39.0	2.6	2.0	2.0	88.2	94.2	0.38
55	34.0	2.3	1.8	1.8	91.7	89.7	0.36
56	29.0	2.1	1.6	1.6	94.6	86.5	0.33
57	24.0	1.8	1.4	1.4	96.9	81.1	0.30

58	19.0	1.6	1.2	1.2	98.4	76.9	0.27
59	14.0	1.3	1.0	1.0	99.5	69.6	0.22
60	9.0	0.9	0.7	0.7	99.9	62.2	0.17

4.4 Test Case 4

Test Case 4 tests operation of the surf model in the same manner as Test Case 3, but the tide elevation is positive. The high tide creates a narrower surf zone because the waves begin breaking on a steeper part of the beach. A steep beach profile causes an increase in the percentage of plunging breakers and an increase in the longshore or littoral current velocity.

The subroutines called during execution of Test Case 4 are:

b_detail	b_head	balanceq	c_fine	c_gamma	c_in_dep
c_regrid	c_un	calc_hb3	calcroll	calcsurf	depdrvr
f2	f3	genspec	get_brk	get_diss	get_m
get_p	get_rhs	get_wave	gridout	gt_p	gt_sig_h
initlize	integrat	klong	lin_1	lin_2	lin_3
long1	main_wav	mdsrf1	mdsrf2	new_brk	percent
prt_out1	prt_out3	pt2	rad_st1	rad_st2	rm2
s_coeff	s_nosurf	s_tide	seafit	setup	shortout
slf_strt	srfsetup	summary	surf	surfcast	swlfit
wavefit	wavenum	weightfn	zone1		

The Depth Profile input file (medsand.dep) is provided in Appendix C to avoid repeating the contents of this file for each test case.

4.4.1 Test Case 4 Input File - Case4.in

```
case4.in                 Line 1  - Input Filename
1998102714               Line 2  - Year Month Day
case 4 modified          Line 3  - Landing Zone Name
medsand.dep              Line 4  - Input Depth Profile File Name
                         Line 5  - Input Wave Spectrum File Name
None                     Line 6  - Input Wave Refraction File Name
315                      Line 7  - Compass Heading Toward Beach
                         Line 8  - Sediment Type
15                       Line 9  - Starting Depth
                         Line 10 - Offshore Wave Spectrum Depth
3 5 145 2 10 140         Line 11 - Sea and Swell Parameters
13 165 1                 Line 12 - Wind Speed, Wind Direction, Tide Elevation
5                        Line 13 - Output Data Grid Spacing
```

4.4.2 Test Case 4 Detailed Output File - Case4.out

```
      *****  *****  Surf Forecast  *****  *****
Navy Standard Surf Model     Version 3.1
Date and Time of Forecast:  10/27/1998   1400
Session Logged to file case4.out
Shallow Water Wave Refraction Only
Landing Zone Name                 = case 4 modified
Sight Line                  = 315.0 deg
Interval                    =   5.0 ft
Starting Depth              =  15.0 ft
Depth Profile File          =  medsand.dep
Sea   Height, Period, Direction =   3.0 ft,  5.0 sec, 145.0  deg
Swell Height, Period, Direction =   2.0 ft, 10.0 sec, 140.0  deg
Wind Speed                  =  13.0 kts
Wind Direction              = 165.0 deg
Tide Level                  =   1.0 ft
Internal grid spacing =  2.0 ft
Option : Internally Generated Spectrum Used
Significant Wave Height Offshore =    3.6 ft
Significant Wave Height =    3.6 ft
Peak Frequency =    0.10 Hz
Zero-Crossing Frequency =    0.22 Hz
Peak Period =    10.0 sec
Percent of Breaking Waves is less than  5.0 %  at starting depth.
Self Starting option was selected.

     *****  *****  Coded Surf Forecast Follows  *****  *****
 Significant Breaker Height                    alfa =    3.8 ft
 Maximum Breaker Height                       bravo =    5.8 ft
 Dominant Breaker Period                    charlie =   10.0 sec
 Dominant Breaker Type                        delta = Spilling Surf
 ( 82% Spilling,  18% Plunging,   0% Surging)
 Breaker Angle (toward right flank)            echo =    3.0 deg
 Littoral Current (toward right flank)      foxtrot =    0.4 kts
 Number of Surf Lines                         golf1 =    1.6
 Surf Zone Width                              golf2 =  204.0 ft
 Wind Speed                                  hotel1 =   13.0 kts
 Wind Direction                              hotel2 =  165.0 deg
 Modified Surf Index =      4.1

   *****  *****  Detailed Surf Output Follows  *****  *****
 Indx   Dist   Water  Sig Brkr  Max Brkr  Prcnt  Wave   Littoral
      Offshore Depth   Height    Height   Brkng  Lngth  Current
        (ft)    (ft)    (ft)      (ft)    waves  (ft)    (kts)

   1   270.0    10.2    3.9       6.0     5.0   177.5    0.13
   2   265.0    10.1    3.9       6.0     5.3   175.9    0.14
   3   260.0    10.0    3.9       6.0     5.6   174.8    0.16
   4   255.0     9.9    3.9       6.0     5.9   174.0    0.17
   5   250.0     9.8    3.9       6.0     6.3   172.8    0.18
   6   245.0     9.6    3.9       6.0     6.6   172.0    0.19
   7   240.0     9.5    3.9       5.9     7.0   170.7    0.20
   8   235.0     9.4    3.9       5.9     7.4   169.9    0.21
   9   230.0     9.3    3.9       5.9     7.8   168.6    0.22
  10   225.0     9.1    3.9       5.9     8.3   167.7    0.22
  11   220.0     9.0    3.8       5.9     8.7   166.4    0.23
  12   215.0     8.9    3.8       5.9     9.2   165.6    0.24
  13   210.0     8.8    3.8       5.8     9.7   164.2    0.25
```

14	205.0	8.6	3.8	5.8	10.3	163.3	0.26
15	200.0	8.5	3.8	5.8	10.9	161.9	0.27
16	195.0	8.4	3.8	5.8	11.5	161.0	0.28
17	190.0	8.3	3.7	5.7	12.1	159.6	0.29
18	185.0	8.1	3.7	5.7	12.8	158.6	0.30
19	180.0	8.0	3.7	5.7	13.5	157.1	0.31
20	175.0	7.9	3.7	5.6	14.3	155.6	0.32
21	170.0	7.7	3.6	5.6	15.1	154.0	0.33
22	165.0	7.6	3.6	5.5	15.9	153.0	0.34
23	160.0	7.5	3.6	5.5	16.8	151.4	0.35
24	155.0	7.3	3.6	5.5	17.8	150.3	0.35
25	150.0	7.2	3.5	5.4	18.8	148.6	0.36
26	145.0	7.0	3.5	5.4	19.8	147.5	0.37
27	140.0	6.9	3.5	5.3	20.9	145.8	0.38
28	135.0	6.7	3.4	5.2	22.1	145.2	0.39
29	130.0	6.6	3.4	5.1	23.4	143.4	0.40
30	125.0	6.5	3.3	5.0	24.8	142.1	0.40
31	120.0	6.3	3.3	4.9	26.2	140.3	0.41
32	115.0	6.2	3.3	4.8	27.6	139.0	0.42
33	110.0	6.0	3.2	4.7	29.3	137.0	0.42
34	105.0	5.8	3.2	4.5	31.1	135.6	0.43
35	100.0	5.7	3.1	4.4	33.0	133.6	0.43
36	95.0	5.5	3.1	4.3	35.0	132.2	0.44
37	90.0	5.3	3.0	4.2	37.4	129.9	0.44
38	85.0	5.2	2.9	4.0	39.9	128.4	0.44
39	80.0	5.0	2.9	3.9	42.7	126.0	0.45
40	75.0	4.8	2.8	3.8	45.7	124.4	0.45
41	70.0	4.6	2.8	3.6	49.2	121.8	0.45
42	65.0	4.5	2.7	3.5	53.0	120.0	0.45
43	60.0	4.3	2.6	3.3	57.0	117.1	0.44
44	55.0	4.1	2.5	3.2	60.9	115.2	0.44
45	50.0	3.9	2.5	3.0	65.6	112.0	0.43
46	45.0	3.7	2.4	2.8	70.4	109.8	0.43
47	40.0	3.4	2.3	2.7	75.7	106.0	0.42
48	35.0	3.2	2.3	2.5	80.8	103.4	0.41
49	30.0	2.9	2.2	2.3	85.9	99.0	0.39
50	25.0	2.7	2.1	2.1	90.1	95.9	0.37
51	20.0	2.4	1.9	1.9	94.1	90.0	0.35
52	15.0	2.1	1.6	1.6	96.8	85.8	0.32
53	10.0	1.6	1.3	1.3	99.2	74.0	0.28
54	5.0	1.1	0.9	0.9	99.8	65.1	0.22

4.4.3 Test Case 4 Summary Output File – Case4.dat

1	270.0	10.2	3.9	6.0	5.0	177.5	0.13
2	265.0	10.1	3.9	6.0	5.3	175.9	0.14
3	260.0	10.0	3.9	6.0	5.6	174.8	0.16
4	255.0	9.9	3.9	6.0	5.9	174.0	0.17
5	250.0	9.8	3.9	6.0	6.3	172.8	0.18
6	245.0	9.6	3.9	6.0	6.6	172.0	0.19
7	240.0	9.5	3.9	5.9	7.0	170.7	0.20
8	235.0	9.4	3.9	5.9	7.4	169.9	0.21
9	230.0	9.3	3.9	5.9	7.8	168.6	0.22
10	225.0	9.1	3.9	5.9	8.3	167.7	0.22
11	220.0	9.0	3.8	5.9	8.7	166.4	0.23
12	215.0	8.9	3.8	5.9	9.2	165.6	0.24
13	210.0	8.8	3.8	5.8	9.7	164.2	0.25
14	205.0	8.6	3.8	5.8	10.3	163.3	0.26
15	200.0	8.5	3.8	5.8	10.9	161.9	0.27
16	195.0	8.4	3.8	5.8	11.5	161.0	0.28
17	190.0	8.3	3.7	5.7	12.1	159.6	0.29
18	185.0	8.1	3.7	5.7	12.8	158.6	0.30
19	180.0	8.0	3.7	5.7	13.5	157.1	0.31
20	175.0	7.9	3.7	5.6	14.3	155.6	0.32
21	170.0	7.7	3.6	5.6	15.1	154.0	0.33
22	165.0	7.6	3.6	5.5	15.9	153.0	0.34
23	160.0	7.5	3.6	5.5	16.8	151.4	0.35
24	155.0	7.3	3.6	5.5	17.8	150.3	0.35
25	150.0	7.2	3.5	5.4	18.8	148.6	0.36
26	145.0	7.0	3.5	5.4	19.8	147.5	0.37
27	140.0	6.9	3.5	5.3	20.9	145.8	0.38
28	135.0	6.7	3.4	5.2	22.1	145.2	0.39
29	130.0	6.6	3.4	5.1	23.4	143.4	0.40
30	125.0	6.5	3.3	5.0	24.8	142.1	0.40
31	120.0	6.3	3.3	4.9	26.2	140.3	0.41
32	115.0	6.2	3.3	4.8	27.6	139.0	0.42
33	110.0	6.0	3.2	4.7	29.3	137.0	0.42
34	105.0	5.8	3.2	4.5	31.1	135.6	0.43
35	100.0	5.7	3.1	4.4	33.0	133.6	0.43
36	95.0	5.5	3.1	4.3	35.0	132.2	0.44
37	90.0	5.3	3.0	4.2	37.4	129.9	0.44
38	85.0	5.2	2.9	4.0	39.9	128.4	0.44
39	80.0	5.0	2.9	3.9	42.7	126.0	0.45
40	75.0	4.8	2.8	3.8	45.7	124.4	0.45
41	70.0	4.6	2.8	3.6	49.2	121.8	0.45
42	65.0	4.5	2.7	3.5	53.0	120.0	0.45
43	60.0	4.3	2.6	3.3	57.0	117.1	0.44
44	55.0	4.1	2.5	3.2	60.9	115.2	0.44
45	50.0	3.9	2.5	3.0	65.6	112.0	0.43
46	45.0	3.7	2.4	2.8	70.4	109.8	0.43
47	40.0	3.4	2.3	2.7	75.7	106.0	0.42
48	35.0	3.2	2.3	2.5	80.8	103.4	0.41
49	30.0	2.9	2.2	2.3	85.9	99.0	0.39
50	25.0	2.7	2.1	2.1	90.1	95.9	0.37
51	20.0	2.4	1.9	1.9	94.1	90.0	0.35
52	15.0	2.1	1.6	1.6	96.8	85.8	0.32
53	10.0	1.6	1.3	1.3	99.2	74.0	0.28
54	5.0	1.1	0.9	0.9	99.8	65.1	0.22

4.5 Test Case 5

Test Case 5 is identical to Test Case 4, except for the negative tide elevation. This case further tests the code that modifies water depths for tide elevations and the numerous algorithms that are depth and /or beach slope dependent. The change in surf conditions causes more spilling breakers and a larger surf zone width than Case 4 as a result of depth dependencies.

The subroutines called during execution of Test Case 5 are:

b_detail	b_head	balanceq	c_fine	c_gamma	c_in_dep
c_regrid	c_un	calc_hb3	calcroll	calcsurf	depdrvr
f2	f3	genspec	get_brk	get_diss	get_m
get_p	get_rhs	get_wave	gridout	gt_p	gt_sig_h
initlize	integrat	klong	lin_1	lin_2	lin_3
long1	main_wav	mdsrf1	mdsrf2	new_brk	percent
prt_out1	prt_out3	pt2	rad_st1	rad_st2	rn2
s_coeff	s_nosurf	s_tide	seafit	setup	shortout
slf_strt	srfsetup	summary	surf	surfcast	swlfit
wavefit	wavenum	weightfn	zone1		

The Depth Profile input file (medsand.dep) is provided in Appendix C to avoid repeating the contents of this file for each test case.

4.5.1 Test Case 5 Input File - Case5.in

```
case5.in                Line 1  - Input Filename
1998102714              Line 2  - Year Month Day
case 5 modified         Line 3  - Landing Zone Name
medsand.dep             Line 4  - Input Depth Profile File Name
                        Line 5  - Input Wave Spectrum File Name
None                    Line 6  - Input Wave Refraction File Name
315                     Line 7  - Compass Heading Toward Beach
                        Line 8  - Sediment Type
15                      Line 9  - Starting Depth
                        Line 10 - Offshore Wave Spectrum Depth
3 5 145 2 10 140        Line 11 - Sea and Swell Parameters
13 165 -1               Line 12 - Wind Speed, Wind Direction, Tide Elevation
5                       Line 13 - Output Data Grid Spacing
```

4.5.2 Test Case 5 Detailed Output File - Case5.out

```
      *****  *****  Surf Forecast  *****  *****
Navy Standard Surf Model     Version 3.1
Date and Time of Forecast:  10/27/1998   1400
Session Logged to file case5.out
Shallow Water Wave Refraction Only
Landing Zone Name                  = case 5 modified
Sight Line                  = 315.0 deg
Interval                    =   5.0 ft
Starting Depth              =  15.0 ft
Depth Profile File          =  medsand.dep
Sea   Height, Period, Direction =   3.0 ft,  5.0 sec, 145.0  deg
Swell Height, Period, Direction =   2.0 ft, 10.0 sec, 140.0  deg
Wind Speed                  =  13.0 kts
Wind Direction              = 165.0 deg
Tide Level                  =  -1.0 ft
Internal grid spacing =  2.0 ft
Option : Internally Generated Spectrum Used
Significant Wave Height Offshore =    3.6 ft
Significant Wave Height =    3.6 ft
Peak Frequency =    0.10 Hz
Zero-Crossing Frequency =    0.22 Hz
Peak Period =    10.0 sec
Percent of Breaking Waves is less than  5.0 %  at starting depth.
Self Starting option was selected.

    *****  *****  Coded Surf Forecast Follows  *****  *****
Significant Breaker Height                    alfa =    3.7 ft
Maximum Breaker Height                       bravo =    5.7 ft
Dominant Breaker Period                    charlie =   10.0 sec
Dominant Breaker Type                        delta = Spilling Surf
( 90% Spilling,  10% Plunging,   0% Surging)
Breaker Angle (toward right flank)            echo =    3.0 deg
Littoral Current (toward right flank)      foxtrot =    0.5 kts
Number of Surf Lines                         golf1 =    2.1
Surf Zone Width                              golf2 =  260.0 ft
Wind Speed                                  hotel1 =   13.0 kts
Wind Direction                              hotel2 =  165.0 deg
Modified Surf Index =      4.0

   *****  *****  Detailed Surf Output Follows  *****  *****
Indx   Dist    Water  Sig Brkr  Max Brkr  Prcnt  Wave   Littoral
     Offshore Depth   Height    Height    Brkng  Lngth  Current
       (ft)    (ft)    (ft)      (ft)     waves  (ft)   (kts)

  1   336.3    10.0    3.8       5.9      5.0    175.5    0.13
  2   331.3     9.9    3.8       5.9      5.3    174.4    0.15
  3   326.3     9.8    3.8       5.9      5.6    173.4    0.16
  4   321.3     9.7    3.8       5.8      5.9    172.3    0.17
  5   316.3     9.6    3.8       5.8      6.2    171.2    0.18
  6   311.3     9.5    3.8       5.8      6.5    170.4    0.19
  7   306.3     9.3    3.8       5.8      6.8    169.3    0.20
  8   301.3     9.2    3.8       5.8      7.2    168.5    0.21
  9   296.3     9.1    3.8       5.8      7.6    167.3    0.22
 10   291.3     9.0    3.8       5.8      8.0    166.6    0.23
 11   286.3     8.9    3.8       5.7      8.4    165.4    0.24
 12   281.3     8.8    3.7       5.7      8.8    164.6    0.25
 13   276.3     8.7    3.7       5.7      9.2    163.4    0.26
```

14	271.3	8.6	3.7	5.7	9.7	162.5	0.27
15	266.3	8.4	3.7	5.7	10.2	161.3	0.28
16	261.3	8.3	3.7	5.6	10.7	160.4	0.29
17	256.3	8.2	3.7	5.6	11.2	159.2	0.29
18	251.3	8.1	3.6	5.6	11.8	158.3	0.30
19	246.3	8.0	3.6	5.6	12.4	157.0	0.31
20	241.3	7.9	3.6	5.5	13.0	156.2	0.32
21	236.3	7.8	3.6	5.5	13.6	154.3	0.33
22	231.3	7.6	3.6	5.5	14.3	153.4	0.34
23	226.3	7.5	3.5	5.4	15.0	152.0	0.35
24	221.3	7.4	3.5	5.4	15.7	151.1	0.36
25	216.3	7.3	3.5	5.3	16.5	149.6	0.37
26	211.3	7.1	3.5	5.3	17.3	148.7	0.38
27	206.3	7.0	3.4	5.3	18.1	147.2	0.39
28	201.3	6.9	3.4	5.2	18.9	146.2	0.39
29	196.3	6.8	3.4	5.2	19.9	145.2	0.40
30	191.3	6.6	3.3	5.1	20.9	144.2	0.41
31	186.3	6.5	3.3	5.1	21.8	142.6	0.42
32	181.3	6.4	3.3	5.0	22.8	141.6	0.43
33	176.3	6.3	3.2	4.9	23.9	140.0	0.43
34	171.3	6.1	3.2	4.8	25.0	138.9	0.44
35	166.3	6.0	3.2	4.7	26.3	137.2	0.45
36	161.3	5.9	3.1	4.6	27.6	136.0	0.45
37	156.3	5.7	3.1	4.5	28.9	134.3	0.46
38	151.3	5.6	3.0	4.4	30.3	133.1	0.46
39	146.3	5.5	3.0	4.3	31.9	131.3	0.47
40	141.3	5.3	2.9	4.1	33.5	130.0	0.47
41	136.3	5.2	2.9	4.0	35.3	128.1	0.48
42	131.3	5.0	2.8	3.9	37.0	126.9	0.48
43	126.3	4.9	2.8	3.8	39.1	124.9	0.48
44	121.3	4.7	2.7	3.7	41.2	123.5	0.48
45	116.3	4.6	2.7	3.6	43.6	121.4	0.49
46	111.3	4.4	2.6	3.5	46.2	120.0	0.48
47	106.3	4.3	2.6	3.4	48.9	117.8	0.48
48	101.3	4.1	2.5	3.2	51.8	116.3	0.48
49	96.3	4.0	2.4	3.1	55.0	113.9	0.48
50	91.3	3.8	2.4	3.0	58.2	112.2	0.47
51	86.3	3.7	2.3	2.9	61.3	109.8	0.47
52	81.3	3.5	2.2	2.7	64.4	108.1	0.46
53	76.3	3.3	2.2	2.6	67.9	105.3	0.45
54	71.3	3.2	2.1	2.5	71.6	103.4	0.44
55	66.3	3.0	2.0	2.3	75.3	100.4	0.43
56	61.3	2.8	2.0	2.2	79.0	98.4	0.41
57	56.3	2.6	1.9	2.1	82.8	95.0	0.40
58	51.3	2.5	1.8	1.9	86.2	92.7	0.38
59	46.3	2.3	1.8	1.8	89.6	88.9	0.35
60	41.3	2.1	1.6	1.6	92.4	86.3	0.33
61	36.3	1.9	1.5	1.5	94.9	82.0	0.30
62	31.3	1.7	1.3	1.3	96.7	78.9	0.27
63	26.3	1.4	1.1	1.1	98.2	73.6	0.24
64	21.3	1.2	0.9	0.9	99.2	69.9	0.20
65	16.3	0.9	0.7	0.7	99.8	63.3	0.16

4.5.3 Test Case 5 Summary Output File – Case5.dat

1	336.3	10.0	3.8	5.9	5.0	175.5	0.13
2	331.3	9.9	3.8	5.9	5.3	174.4	0.15
3	326.3	9.8	3.8	5.9	5.6	173.4	0.16
4	321.3	9.7	3.8	5.8	5.9	172.3	0.17
5	316.3	9.6	3.8	5.8	6.2	171.2	0.18
6	311.3	9.5	3.8	5.8	6.5	170.4	0.19
7	306.3	9.3	3.8	5.8	6.8	169.3	0.20
8	301.3	9.2	3.8	5.8	7.2	168.5	0.21
9	296.3	9.1	3.8	5.8	7.6	167.3	0.22
10	291.3	9.0	3.8	5.8	8.0	166.6	0.23
11	286.3	8.9	3.8	5.7	8.4	165.4	0.24
12	281.3	8.8	3.7	5.7	8.8	164.6	0.25
13	276.3	8.7	3.7	5.7	9.2	163.4	0.26
14	271.3	8.6	3.7	5.7	9.7	162.5	0.27
15	266.3	8.4	3.7	5.7	10.2	161.3	0.28
16	261.3	8.3	3.7	5.6	10.7	160.4	0.29
17	256.3	8.2	3.7	5.6	11.2	159.2	0.29
18	251.3	8.1	3.6	5.6	11.8	158.3	0.30
19	246.3	8.0	3.6	5.6	12.4	157.0	0.31
20	241.3	7.9	3.6	5.5	13.0	156.2	0.32
21	236.3	7.8	3.6	5.5	13.6	154.3	0.33
22	231.3	7.6	3.6	5.5	14.3	153.4	0.34
23	226.3	7.5	3.5	5.4	15.0	152.0	0.35
24	221.3	7.4	3.5	5.4	15.7	151.1	0.36
25	216.3	7.3	3.5	5.3	16.5	149.6	0.37
26	211.3	7.1	3.5	5.3	17.3	148.7	0.38
27	206.3	7.0	3.4	5.3	18.1	147.2	0.39
28	201.3	6.9	3.4	5.2	18.9	146.2	0.39
29	196.3	6.8	3.4	5.2	19.9	145.2	0.40
30	191.3	6.6	3.3	5.1	20.9	144.2	0.41
31	186.3	6.5	3.3	5.1	21.8	142.6	0.42
32	181.3	6.4	3.3	5.0	22.8	141.6	0.43
33	176.3	6.3	3.2	4.9	23.9	140.0	0.43
34	171.3	6.1	3.2	4.8	25.0	138.9	0.44
35	166.3	6.0	3.2	4.7	26.3	137.2	0.45
36	161.3	5.9	3.1	4.6	27.6	136.0	0.45
37	156.3	5.7	3.1	4.5	28.9	134.3	0.46
38	151.3	5.6	3.0	4.4	30.3	133.1	0.46
39	146.3	5.5	3.0	4.3	31.9	131.3	0.47
40	141.3	5.3	2.9	4.1	33.5	130.0	0.47
41	136.3	5.2	2.9	4.0	35.3	128.1	0.48
42	131.3	5.0	2.8	3.9	37.0	126.9	0.48
43	126.3	4.9	2.8	3.8	39.1	124.9	0.48
44	121.3	4.7	2.7	3.7	41.2	123.5	0.48
45	116.3	4.6	2.7	3.6	43.6	121.4	0.49
46	111.3	4.4	2.6	3.5	46.2	120.0	0.48
47	106.3	4.3	2.6	3.4	48.9	117.8	0.48
48	101.3	4.1	2.5	3.2	51.8	116.3	0.48
49	96.3	4.0	2.4	3.1	55.0	113.9	0.48
50	91.3	3.8	2.4	3.0	58.2	112.2	0.47
51	86.3	3.7	2.3	2.9	61.3	109.8	0.47
52	81.3	3.5	2.2	2.7	64.4	108.1	0.46
53	76.3	3.3	2.2	2.6	67.9	105.3	0.45
54	71.3	3.2	2.1	2.5	71.6	103.4	0.44
55	66.3	3.0	2.0	2.3	75.3	100.4	0.43
56	61.3	2.8	2.0	2.2	79.0	98.4	0.41
57	56.3	2.6	1.9	2.1	82.8	95.0	0.40

58	51.3	2.5	1.8	1.9	86.2	92.7	0.38
59	46.3	2.3	1.8	1.8	89.6	88.9	0.35
60	41.3	2.1	1.6	1.6	92.4	86.3	0.33
61	36.3	1.9	1.5	1.5	94.9	82.0	0.30
62	31.3	1.7	1.3	1.3	96.7	78.9	0.27
63	26.3	1.4	1.1	1.1	98.2	73.6	0.24
64	21.3	1.2	0.9	0.9	99.2	69.9	0.20
65	16.3	0.9	0.7	0.7	99.8	63.3	0.16

4.6 Test Case 6

Test Case 6 uses the same wave conditions as Cases 3, 4, and 5, but the tide elevation is zero relative to the specified depth profile. Case 6 exercises the internal straight coast wave refraction surf model option. This option uses analytical wave refraction algorithms derived from linear wave theory. Longshore current and Modified Surf Index values are reduced when wave refraction is considered because wave crests tend to become more parallel with the beach in shallow water.

The subroutines called during execution of Test Case 6 are:

b_detail	b_head	balanceq	c_fine	c_gamma	c_in_dep
c_regrid	c_un	calc_hb3	calcroll	calcsurf	depdrvr
f2	f3	genspec	get_brk	get_diss	get_m
get_p	get_rhs	get_wave	gridout	gt_p	gt_sig_h
initlize	integrat	klong	lin_1	lin_2	lin_3
long1	main_wav	mdsrf1	mdsrf2	new_brk	percent
prt_out1	prt_out3	pt2	rad_st1	rad_st2	rn2
s_coeff	s_nosurf	s_tide	seafit	setup	shortout
slf_strt	srfsetup	strfrac	summary	surf	surfcast
swlfit	wavefit	wavenum	weightfn	zone1	

The Depth Profile input file (medsand.dep) is in Appendix C to avoid repeating the contents of this file for each test case.

4.6.1 Test Case 6 Input File - Case6.in

```
case6.in                Line 1  - Input Filename
1998102714              Line 2  - Year Month Day
case 6 modified         Line 3  - Landing Zone Name
medsand.dep             Line 4  - Input Depth Profile File Name
                        Line 5  - Input Wave Spectrum File Name
                        Line 6  - Input Wave Refraction File Name
315                     Line 7  - Compass Heading Toward Beach
                        Line 8  - Sediment Type
15                      Line 9  - Starting Depth
                        Line 10 - Offshore Wave Spectrum Depth
3 5 145 2 10 140        Line 11 - Sea and Swell Parameters
13 165 0                Line 12 - Wind Speed, Wind Direction, Tide Elevation
5                       Line 13 - Output Data Grid Spacing
```

4.6.2 Test Case 6 Detailed Output File - Case6.out

```
     *****  *****  Surf Forecast  *****  *****
Navy Standard Surf Model     Version 3.1
Date and Time of Forecast:  10/27/1998   1400
Session Logged to file case6.out
Straight Coast Wave Refraction
Landing Zone                = case 6 modified
Sight Line                  = 315.0 deg
Interval                    =   5.0 ft
Starting Depth              =  15.0 ft
Depth Profile File          =  medsand.dep
Sea   Height, Period, Direction =   3.0 ft,  5.0 sec, 145.0  deg
Swell Height, Period, Direction =   2.0 ft, 10.0 sec, 140.0  deg
Wind Speed                  =  13.0 kts
Wind Direction              = 165.0 deg
Tide Level                  =   0.0 ft
Internal grid spacing =  2.0 ft
Option : Internally Generated Spectrum Used
Significant Wave Height Offshore =     3.4 ft
Significant Wave Height =     3.4 ft
Peak Frequency =     0.10 Hz
Zero-Crossing Frequency =     0.21 Hz
Peak Period =     10.0 sec
Percent of Breaking Waves is less than  5.0 %  at starting depth.
Self Starting option was selected.

     *****  *****  Coded Surf Forecast Follows  *****  *****
 Significant Breaker Height                      alfa =    3.7 ft
 Maximum Breaker Height                         bravo =    5.6 ft
 Dominant Breaker Period                      charlie =   10.0 sec
 Dominant Breaker Type                          delta = Spilling Surf
 ( 83% Spilling,  17% Plunging,    0% Surging)
 Breaker Angle (toward right flank)              echo =    1.1 deg
 Littoral Current (toward right flank)        foxtrot =    0.2 kts
 Number of Surf Lines                           golf1 =    1.8
 Surf Zone Width                                golf2 =  224.0 ft
 Wind Speed                                    hotel1 =   13.0 kts
 Wind Direction                                hotel2 =  165.0 deg
 Modified Surf Index =      3.3

    *****  *****  Detailed Surf Output Follows  *****  *****
 Indx   Dist    Water  Sig Brkr  Max Brkr  Prcnt  Wave   Littoral
      Offshore Depth   Height    Height   Brkng  Lngth  Current
        (ft)    (ft)    (ft)      (ft)    waves  (ft)    (kts)

   1   290.0     9.8     3.8       5.8     5.1   173.7    0.13
   2   285.0     9.7     3.8       5.8     5.5   172.1    0.14
   3   280.0     9.5     3.8       5.8     5.8   170.9    0.14
   4   275.0     9.4     3.8       5.7     6.1   170.1    0.14
   5   270.0     9.3     3.7       5.7     6.5   168.9    0.14
   6   265.0     9.2     3.7       5.7     6.9   168.1    0.14
   7   260.0     9.1     3.7       5.7     7.3   166.9    0.15
   8   255.0     9.0     3.7       5.7     7.7   166.1    0.15
   9   250.0     8.8     3.7       5.7     8.1   164.9    0.15
  10   245.0     8.7     3.7       5.7     8.6   164.0    0.15
  11   240.0     8.6     3.7       5.6     9.1   162.7    0.15
  12   235.0     8.5     3.7       5.6     9.6   161.8    0.16
  13   230.0     8.4     3.7       5.6    10.1   160.5    0.16
```

14	225.0	8.2	3.6	5.6	10.7	159.6	0.16
15	220.0	8.1	3.6	5.6	11.4	158.2	0.16
16	215.0	8.0	3.6	5.5	12.0	157.3	0.17
17	210.0	7.9	3.6	5.5	12.6	155.9	0.17
18	205.0	7.7	3.6	5.5	13.4	154.9	0.17
19	200.0	7.6	3.6	5.4	14.1	153.4	0.17
20	195.0	7.5	3.5	5.4	14.9	152.0	0.17
21	190.0	7.4	3.5	5.4	15.7	150.5	0.18
22	185.0	7.2	3.5	5.3	16.6	149.5	0.18
23	180.0	7.1	3.5	5.3	17.5	147.9	0.18
24	175.0	7.0	3.4	5.2	18.5	146.8	0.18
25	170.0	6.8	3.4	5.2	19.5	145.2	0.19
26	165.0	6.7	3.4	5.1	20.6	144.1	0.19
27	160.0	6.6	3.3	5.1	21.8	142.4	0.19
28	155.0	6.4	3.3	5.0	23.0	141.8	0.19
29	150.0	6.3	3.3	4.9	24.3	140.1	0.19
30	145.0	6.1	3.2	4.8	25.6	138.9	0.20
31	140.0	6.0	3.2	4.7	27.0	137.1	0.20
32	135.0	5.9	3.1	4.6	28.6	135.9	0.20
33	130.0	5.7	3.1	4.5	30.2	134.0	0.20
34	125.0	5.6	3.0	4.3	32.0	132.7	0.20
35	120.0	5.4	3.0	4.2	33.9	130.7	0.20
36	115.0	5.3	2.9	4.1	35.9	129.3	0.20
37	110.0	5.1	2.9	4.0	37.9	127.2	0.20
38	105.0	5.0	2.8	3.9	40.4	125.8	0.20
39	100.0	4.8	2.8	3.7	43.1	123.5	0.20
40	95.0	4.6	2.7	3.6	45.9	122.0	0.20
41	90.0	4.5	2.7	3.5	48.8	119.7	0.20
42	85.0	4.3	2.6	3.4	52.4	118.0	0.20
43	80.0	4.1	2.5	3.2	55.9	115.5	0.20
44	75.0	4.0	2.5	3.1	59.4	113.7	0.20
45	70.0	3.8	2.4	3.0	63.0	111.0	0.19
46	65.0	3.6	2.3	2.8	67.2	109.0	0.19
47	60.0	3.4	2.3	2.7	71.3	106.0	0.19
48	55.0	3.2	2.2	2.5	75.8	103.8	0.18
49	50.0	3.0	2.1	2.4	80.0	100.3	0.18
50	45.0	2.8	2.1	2.2	84.3	97.8	0.17
51	40.0	2.6	2.0	2.0	88.0	93.9	0.16
52	35.0	2.4	1.9	1.9	91.6	90.9	0.15
53	30.0	2.1	1.7	1.7	94.4	86.2	0.14
54	25.0	1.9	1.5	1.5	96.7	82.6	0.13
55	20.0	1.6	1.3	1.3	98.3	76.6	0.11
56	15.0	1.3	1.0	1.0	99.4	71.7	0.10
57	10.0	1.0	0.8	0.8	99.8	61.8	0.07
58	5.0	0.5	0.4	0.4	100.0	50.8	0.05

4.6.3 Test Case 6 Summary Output File – Case6.dat

1	290.0	9.8	3.8	5.8	5.1	173.7	0.13
2	285.0	9.7	3.8	5.8	5.5	172.1	0.14
3	280.0	9.5	3.8	5.8	5.8	170.9	0.14
4	275.0	9.4	3.8	5.7	6.1	170.1	0.14
5	270.0	9.3	3.7	5.7	6.5	168.9	0.14
6	265.0	9.2	3.7	5.7	6.9	168.1	0.14
7	260.0	9.1	3.7	5.7	7.3	166.9	0.15
8	255.0	9.0	3.7	5.7	7.7	166.1	0.15
9	250.0	8.8	3.7	5.7	8.1	164.9	0.15
10	245.0	8.7	3.7	5.7	8.6	164.0	0.15
11	240.0	8.6	3.7	5.6	9.1	162.7	0.15
12	235.0	8.5	3.7	5.6	9.6	161.8	0.16
13	230.0	8.4	3.7	5.6	10.1	160.5	0.16
14	225.0	8.2	3.6	5.6	10.7	159.6	0.16
15	220.0	8.1	3.6	5.6	11.4	158.2	0.16
16	215.0	8.0	3.6	5.5	12.0	157.3	0.17
17	210.0	7.9	3.6	5.5	12.6	155.9	0.17
18	205.0	7.7	3.6	5.5	13.4	154.9	0.17
19	200.0	7.6	3.6	5.4	14.1	153.4	0.17
20	195.0	7.5	3.5	5.4	14.9	152.0	0.17
21	190.0	7.4	3.5	5.4	15.7	150.5	0.18
22	185.0	7.2	3.5	5.3	16.6	149.5	0.18
23	180.0	7.1	3.5	5.3	17.5	147.9	0.18
24	175.0	7.0	3.4	5.2	18.5	146.8	0.18
25	170.0	6.8	3.4	5.2	19.5	145.2	0.19
26	165.0	6.7	3.4	5.1	20.6	144.1	0.19
27	160.0	6.6	3.3	5.1	21.8	142.4	0.19
28	155.0	6.4	3.3	5.0	23.0	141.8	0.19
29	150.0	6.3	3.3	4.9	24.3	140.1	0.19
30	145.0	6.1	3.2	4.8	25.6	138.9	0.20
31	140.0	6.0	3.2	4.7	27.0	137.1	0.20
32	135.0	5.9	3.1	4.6	28.6	135.9	0.20
33	130.0	5.7	3.1	4.5	30.2	134.0	0.20
34	125.0	5.6	3.0	4.3	32.0	132.7	0.20
35	120.0	5.4	3.0	4.2	33.9	130.7	0.20
36	115.0	5.3	2.9	4.1	35.9	129.3	0.20
37	110.0	5.1	2.9	4.0	37.9	127.2	0.20
38	105.0	5.0	2.8	3.9	40.4	125.8	0.20
39	100.0	4.8	2.8	3.7	43.1	123.5	0.20
40	95.0	4.6	2.7	3.6	45.9	122.0	0.20
41	90.0	4.5	2.7	3.5	48.8	119.7	0.20
42	85.0	4.3	2.6	3.4	52.4	118.0	0.20
43	80.0	4.1	2.5	3.2	55.9	115.5	0.20
44	75.0	4.0	2.5	3.1	59.4	113.7	0.20
45	70.0	3.8	2.4	3.0	63.0	111.0	0.19
46	65.0	3.6	2.3	2.8	67.2	109.0	0.19
47	60.0	3.4	2.3	2.7	71.3	106.0	0.19
48	55.0	3.2	2.2	2.5	75.8	103.8	0.18
49	50.0	3.0	2.1	2.4	80.0	100.3	0.18
50	45.0	2.8	2.1	2.2	84.3	97.8	0.17
51	40.0	2.6	2.0	2.0	88.0	93.9	0.16
52	35.0	2.4	1.9	1.9	91.6	90.9	0.15
53	30.0	2.1	1.7	1.7	94.4	86.2	0.14
54	25.0	1.9	1.5	1.5	96.7	82.6	0.13
55	20.0	1.6	1.3	1.3	98.3	76.6	0.11
56	15.0	1.3	1.0	1.0	99.4	71.7	0.10
57	10.0	1.0	0.8	0.8	99.8	61.8	0.07
58	5.0	0.5	0.4	0.4	100.0	50.8	0.05

4.7 Test Case 7

Test Case 7 tests the surf model using an external wave refraction file for wave transformation information. This refraction file was created using a separate program, which calculates numerical wave refraction, diffraction, and shoaling. Although the input wave refraction file corresponds to a straight coast depth grid, the additional effects of wave diffraction and interpolation within the surf model cause slight differences in output for Test Case 6 and 7. These differences are within an acceptable range.

The subroutines called during execution of Test Case 7 are:

b_detail	b_head	balanceq	c_fine	c_gamma	c_in_dep
c_regrid	c_un	calc_hb3	calcroll	calcsurf	cubpoly
depdrvr	f2	f3	genrlspl	genspec	get_brk
get_diss	get_m	get_p	get_rhs	get_wave	gridout
gt_p	gt_sig_h	initlize	integrat	klong	lin_1
lin_2	lin_3	long1	main_wav	mdsrf1	mdsrf2
new_brk	percent	prt_out1	prt_out3	pt2	rad_st1
rad_st2	readrfrc	refrac	rn2	s_coeff	s_nosurf
s_tide	seafit	setup	shortout	slf_strt	spline
srfsetup	summary	surf	surfcast	swlfit	wavefit
wavenum	weightfn	zone1			

The Depth Profile input file (medsand.dep) is provided in Appendix C to avoid repeating the contents of this file for each test case.

4.7.1 Test Case 7 Input File - Case7.in

```
case7.in                Line 1  - Input Filename
1998102714              Line 2  - Year Month Day
case 7 modified         Line 3  - Landing Zone Name
medsand.dep             Line 4  - Input Depth Profile File Name
                        Line 5  - Input Wave Spectrum File Name
Case7.ref               Line 6  - Input Wave Refraction File Name
315                     Line 7  - Compass Heading Toward Beach
                        Line 8  - Sediment Type
15                      Line 9  - Starting Depth
                        Line 10 - Offshore Wave Spectrum Depth
3 5 145 2 10 140        Line 11 - Sea and Swell Parameters
13 165 0                Line 12 - Wind Speed, Wind Direction, Tide Elevation
5                       Line 13 - Output Data Grid Spacing
```

4.7.2 Test Case 7 Input Refraction File - Case7.ref

```
99.00000
99.00000
99.00000
      24
6.000000       4.000000
15.00000
7.500000
15.00000
       1
       1  3.5999998E-02  3.8800001E-02  4.1600000E-02
    0.00        0.00        0.00      125.55
  126.20      127.45      129.21      131.37
  133.76      136.24      138.63      140.79
  142.55      143.80      144.45        0.00
    0.00        0.00        0.00        0.00
    0.00        0.00        0.00        0.00
       2  4.1600000E-02  4.4399999E-02  4.7200002E-02
    0.00        0.00        0.00      124.19
  124.93      126.36      128.38      130.85
  133.58      136.42      139.15      141.62
  143.64      145.07      145.81        0.00
    0.00        0.00        0.00        0.00
    0.00        0.00        0.00        0.00
       3  4.7200002E-02  5.0000001E-02  5.2800000E-02
    0.00        0.00        0.00      122.82
  123.66      125.28      127.56      130.33
  133.41      136.59      139.67      142.44
  144.72      146.34      147.18        0.00
    0.00        0.00        0.00        0.00
    0.00        0.00        0.00        0.00
       4  5.2800000E-02  5.5500001E-02  5.8249999E-02
    0.00        0.00        0.00      121.48
  122.42      124.22      126.75      129.82
  133.24      136.76      140.18      143.25
  145.78      147.58      148.52        0.00
    0.00        0.00        0.00        0.00
    0.00        0.00        0.00        0.00
       5  5.8249999E-02  6.1110001E-02  6.3749999E-02
    0.00        0.00        0.00      120.12
  121.15      123.14      125.93      129.31
  133.06      136.94      140.69      144.07
  146.86      148.85      149.88        0.00
    0.00        0.00        0.00        0.00
    0.00        0.00        0.00        0.00
       6  6.3749999E-02  6.6600002E-02  6.9250003E-02
    0.00        0.00        0.00      118.78
  119.91      122.09      125.13      128.81
  132.89      137.11      141.19      144.87
  147.91      150.08      151.22        0.00
    0.00        0.00        0.00        0.00
    0.00        0.00        0.00        0.00
       7  6.9250003E-02  7.2219998E-02  0.7475000
    0.00        0.00        0.00      117.42
  118.65      121.01      124.31      128.30
  132.72      137.28      141.70      145.69
  148.99      151.35      152.58        0.00
    0.00        0.00        0.00        0.00
```

```
      0.00          0.00          0.00          0.00
         8  7.5000003E-02  8.0550000E-02  8.6104997E-02
      0.00          0.00          0.00        115.39
    116.78        119.42        123.11        127.56
    132.47        137.53        142.44        146.89
    150.58        153.22        154.61          0.00
      0.00          0.00          0.00          0.00
      0.00          0.00          0.00          0.00
         9  8.6104997E-02  9.1660000E-02  9.7214997E-02
      0.00          0.00          0.00        112.70
    114.29        117.32        121.52        126.58
    132.14        137.86        143.42        148.48
    152.68        155.71        157.30          0.00
      0.00          0.00          0.00          0.00
      0.00          0.00          0.00          0.00
        10  9.7214997E-02  0.1027700       0.1083250
      0.00          0.00          0.00        110.00
    111.81        115.23        119.96        125.61
    131.81        138.19        144.39        150.04
    154.77        158.19        160.00          0.00
      0.00          0.00          0.00          0.00
      0.00          0.00          0.00          0.00
        11  0.1083250       0.1166600       0.1250000
      0.00          0.00          0.00        106.63
    108.72        112.65        118.04        124.43
    131.41        138.59        145.57        151.96
    157.35        161.28        163.37          0.00
      0.00          0.00          0.00          0.00
      0.00          0.00          0.00          0.00
        12  0.1250000       0.1333300       0.1416650
      0.00          0.00          0.00        102.60
    105.05        109.61        115.79        123.06
    130.95        139.05        146.94        154.21
    160.39        164.95        167.40          0.00
      0.00          0.00          0.00          0.00
      0.00          0.00          0.00          0.00
        13  0.1458300       0.1583300       0.1708300
      0.00          0.00          0.00         96.59
     99.62        105.19        112.57        121.12
    130.31        139.69        148.88        157.43
    164.81        170.38        173.41          0.00
      0.00          0.00          0.00          0.00
      0.00          0.00          0.00          0.00
        14  0.1708300       0.2083300       0.2458300
      0.00          0.00          0.00         84.88
     89.33         97.10        106.88        117.76
    129.20        140.80        152.24        163.12
    172.90        180.67        185.12          0.00
      0.00          0.00          0.00          0.00
      0.00          0.00          0.00          0.00
        15  0.2458300       0.3083300       0.3708300
      0.00          0.00          0.00         64.79
     73.52         86.02         99.62        113.66
    127.87        142.13        156.34        170.38
    183.98        196.48        205.21          0.00
      0.00          0.00          0.00          0.00
      0.00          0.00          0.00          0.00
Title Line
Title Line
```

```
Title Line
          1  3.5999998E-02  3.8800001E-02  4.1600000E-02
    0.00000      0.00000      0.00000      0.40316
    1.17985      1.87098      2.42953      2.82047
    3.02135      3.02135      2.82048      2.42953
    1.87098      1.17986      0.40316      0.00000
    0.00000      0.00000      0.00000      0.00000
    0.00000      0.00000      0.00000      0.00000
          2  4.1600000E-02  4.4399999E-02  4.7200002E-02
    0.00000      0.00000      0.00000      0.35536
    1.03937      1.64658      2.13574      2.47704
    2.65201      2.65201      2.47704      2.13574
    1.64658      1.03937      0.35536      0.00000
    0.00000      0.00000      0.00000      0.00000
    0.00000      0.00000      0.00000      0.00000
          3  4.7200002E-02  5.0000001E-02  5.2800000E-02
    0.00000      0.00000      0.00000      0.31865
    0.93138      1.47385      1.90927      2.21200
    2.36679      2.36679      2.21200      1.90927
    1.47385      0.93138      0.31865      0.00000
    0.00000      0.00000      0.00000      0.00000
    0.00000      0.00000      0.00000      0.00000
          4  5.2800000E-02  5.5500001E-02  5.8249999E-02
    0.00000      0.00000      0.00000      0.29015
    0.84747      1.33941      1.73270      2.00507
    2.14394      2.14394      2.00507      1.73270
    1.33941      0.84747      0.29015      0.00000
    0.00000      0.00000      0.00000      0.00000
    0.00000      0.00000      0.00000      0.00000
          5  5.8249999E-02  6.1110001E-02  6.3749999E-02
    0.00000      0.00000      0.00000      0.26671
    0.77836      1.22846      1.58667      1.83365
    1.95918      1.95918      1.83365      1.58667
    1.22846      0.77836      0.26671      0.00000
    0.00000      0.00000      0.00000      0.00000
    0.00000      0.00000      0.00000      0.00000
          6  6.3749999E-02  6.6600002E-02  6.9250003E-02
    0.00000      0.00000      0.00000      0.24793
    0.72289      1.13917      1.46884      1.69506
    1.80966      1.80966      1.69506      1.46884
    1.13917      0.72290      0.24793      0.00000
    0.00000      0.00000      0.00000      0.00000
    0.00000      0.00000      0.00000      0.00000
          7  6.9250003E-02  7.2219998E-02  0.7475000
    0.00000      0.00000      0.00000      0.23201
    0.67575      1.06302      1.36802      1.57620
    1.68127      1.68127      1.57620      1.36802
    1.06302      0.67575      0.23201      0.00000
    0.00000      0.00000      0.00000      0.00000
    0.00000      0.00000      0.00000      0.00000
          8  7.5000003E-02  8.0550000E-02  8.6104997E-02
    0.00000      0.00000      0.00000      0.21307
    0.61950      0.97169      1.24652      1.43250
    1.52579      1.52579      1.43250      1.24652
    0.97169      0.61950      0.21307      0.00000
    0.00000      0.00000      0.00000      0.00000
    0.00000      0.00000      0.00000      0.00000
          9  8.6104997E-02  9.1660000E-02  9.7214997E-02
    0.00000      0.00000      0.00000      0.19410
```

```
0.56282      0.87891      1.12217      1.28466
1.36543      1.36543      1.28466      1.12217
0.87891      0.56282      0.19410      0.00000
0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000
     10  9.7214997E-02   0.1027700       0.1083250
0.00000      0.00000      0.00000      0.18019
0.52105      0.80966      1.02826      1.17213
1.24294      1.24294      1.17213      1.02826
0.80966      0.52105      0.18019      0.00000
0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000
     11  0.1083250       0.1166600       0.1250000
0.00000      0.00000      0.00000      0.16832
0.48424      0.74680      0.94111      1.06636
1.12715      1.12715      1.06636      0.94111
0.74680      0.48424      0.16832      0.00000
0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000
     12  0.1250000       0.1333300       0.1416650
0.00000      0.00000      0.00000      0.15978
0.45594      0.69563      0.86731      0.97488
1.02612      1.02612      0.97488      0.86731
0.69563      0.45594      0.15978      0.00000
0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000
     13  0.1458300       0.1583300       0.1708300
0.00000      0.00000      0.00000      0.15576
0.43705      0.65338      0.79928      0.88628
0.92646      0.92646      0.88628      0.79928
0.65338      0.43705      0.15576      0.00000
0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000
     14  0.1708300       0.2083300       0.2458300
0.00000      0.00000      0.00000      0.17428
0.46142      0.65000      0.75788      0.81495
0.83957      0.83957      0.81495      0.75788
0.65000      0.46142      0.17428      0.00000
0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000
     15  0.2458300       0.3083300       0.3708300
0.00000      0.00000      0.00000      0.37347
0.70964      0.82176      0.86221      0.87904
0.88551      0.88551      0.87904      0.86221
0.82176      0.70963      0.37347      0.00000
0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000
```

4.7.3 Test Case 7 Detailed Output File - Case7.out

```
      *****  *****  Surf Forecast  *****  *****
Navy Standard Surf Model     Version 3.1
Date and Time of Forecast:  10/27/1998   1400
Session Logged to file case7.out
Wave Refraction File        = case7.ref
Landing Zone                = case 7 modified
Sight Line                  = 315.0 deg
Interval                    =   5.0 ft
Starting Depth              =  15.0 ft
Depth Profile File          =  medsand.dep
Sea   Height, Period, Direction =   3.0 ft,  5.0 sec, 145.0  deg
Swell Height, Period, Direction =   2.0 ft, 10.0 sec, 140.0  deg
Wind Speed                  =  13.0 kts
Wind Direction              = 165.0 deg
Tide Level                  =   0.0 ft
Internal grid spacing =  2.0 ft
Option : Internally Generated Spectrum Used
Significant Wave Height Offshore =    3.2 ft
Significant Wave Height =    3.2 ft
Peak Frequency =    0.10 Hz
Zero-Crossing Frequency =    0.17 Hz
Peak Period =    10.0 sec
Percent of Breaking Waves is less than  5.0 %  at starting depth.
Self Starting option was selected.

    *****  *****  Coded Surf Forecast Follows  *****  *****
 Significant Breaker Height                    alfa =    3.5 ft
 Maximum Breaker Height                       bravo =    5.4 ft
 Dominant Breaker Period                    charlie =   10.0 sec
 Dominant Breaker Type                        delta = Spilling Surf
 ( 79% Spilling,  21% Plunging,   0% Surging)
 Breaker Angle (toward right flank)            echo =    0.9 deg
 Littoral Current (toward right flank)      foxtrot =    0.2 kts
 Number of Surf Lines                         golf1 =    1.7
 Surf Zone Width                              golf2 =  212.0 ft
 Wind Speed                                  hotel1 =   13.0 kts
 Wind Direction                              hotel2 =  165.0 deg
 Modified Surf Index =      3.3

   *****  *****  Detailed Surf Output Follows  *****  *****
 Indx   Dist    Water  Sig Brkr  Max Brkr  Prcnt  Wave   Littoral
      Offshore Depth   Height    Height    Brkng  Lngth  Current
        (ft)    (ft)    (ft)      (ft)     waves  (ft)   (kts)

   1   270.0     9.3    3.6       5.5      5.1   169.7    0.13
   2   265.0     9.2    3.6       5.5      5.5   168.1    0.14
   3   260.0     9.1    3.6       5.5      5.9   166.9    0.14
   4   255.0     9.0    3.6       5.5      6.3   166.1    0.14
   5   250.0     8.9    3.6       5.5      6.7   164.8    0.14
   6   245.0     8.7    3.6       5.5      7.1   164.0    0.14
   7   240.0     8.6    3.6       5.5      7.6   162.6    0.14
   8   235.0     8.5    3.6       5.5      8.1   161.8    0.14
   9   230.0     8.4    3.6       5.4      8.6   160.4    0.14
  10   225.0     8.2    3.5       5.4      9.2   159.5    0.14
  11   220.0     8.1    3.5       5.4      9.9   158.1    0.14
  12   215.0     8.0    3.5       5.4     10.5   157.2    0.15
```

13	210.0	7.9	3.5	5.4	11.2	155.8	0.15
14	205.0	7.8	3.5	5.4	12.0	154.8	0.15
15	200.0	7.6	3.5	5.3	12.8	153.3	0.15
16	195.0	7.5	3.5	5.3	13.6	152.3	0.15
17	190.0	7.4	3.4	5.3	14.4	150.9	0.15
18	185.0	7.2	3.4	5.2	15.4	149.8	0.15
19	180.0	7.1	3.4	5.2	16.4	148.3	0.15
20	175.0	7.0	3.4	5.2	17.5	146.6	0.16
21	170.0	6.8	3.4	5.1	18.6	145.0	0.16
22	165.0	6.7	3.3	5.1	19.8	143.9	0.16
23	160.0	6.6	3.3	5.1	21.1	142.2	0.16
24	155.0	6.4	3.3	5.0	22.5	141.0	0.16
25	150.0	6.3	3.2	4.9	24.0	139.3	0.16
26	145.0	6.2	3.2	4.8	25.5	138.1	0.16
27	140.0	6.0	3.2	4.7	27.1	136.2	0.17
28	135.0	5.9	3.1	4.6	28.9	135.6	0.17
29	130.0	5.7	3.1	4.5	30.7	133.7	0.17
30	125.0	5.6	3.1	4.3	32.8	132.4	0.17
31	120.0	5.4	3.0	4.2	35.0	130.4	0.17
32	115.0	5.3	3.0	4.1	37.2	129.0	0.17
33	110.0	5.1	2.9	4.0	39.6	126.9	0.17
34	105.0	5.0	2.9	3.9	42.4	125.4	0.17
35	100.0	4.8	2.8	3.7	45.4	123.2	0.17
36	95.0	4.6	2.8	3.6	48.6	121.7	0.17
37	90.0	4.5	2.7	3.5	52.0	119.3	0.17
38	85.0	4.3	2.6	3.4	55.6	117.7	0.17
39	80.0	4.1	2.6	3.2	59.3	115.1	0.17
40	75.0	4.0	2.5	3.1	63.4	113.3	0.17
41	70.0	3.8	2.4	3.0	67.4	110.5	0.16
42	65.0	3.6	2.4	2.8	71.8	108.6	0.16
43	60.0	3.4	2.3	2.7	76.0	105.5	0.16
44	55.0	3.2	2.3	2.5	80.3	103.3	0.15
45	50.0	3.0	2.2	2.4	84.1	99.8	0.15
46	45.0	2.8	2.1	2.2	87.8	97.3	0.14
47	40.0	2.6	2.0	2.0	91.0	93.3	0.13
48	35.0	2.4	1.9	1.9	93.8	90.3	0.13
49	30.0	2.2	1.7	1.7	96.0	85.5	0.12
50	25.0	1.9	1.5	1.5	97.7	81.9	0.11
51	20.0	1.6	1.3	1.3	98.8	75.9	0.09
52	15.0	1.3	1.0	1.0	99.6	71.0	0.08
53	10.0	1.0	0.8	0.8	99.9	61.0	0.06
54	5.0	0.5	0.4	0.4	100.0	49.9	0.04

4.7.4 Test Case 7 Summary Output File – Case7.dat

1	270.0	9.3	3.6	5.5	5.1	169.7	0.13
2	265.0	9.2	3.6	5.5	5.5	168.1	0.14
3	260.0	9.1	3.6	5.5	5.9	166.9	0.14
4	255.0	9.0	3.6	5.5	6.3	166.1	0.14
5	250.0	8.9	3.6	5.5	6.7	164.8	0.14
6	245.0	8.7	3.6	5.5	7.1	164.0	0.14
7	240.0	8.6	3.6	5.5	7.6	162.6	0.14
8	235.0	8.5	3.6	5.5	8.1	161.8	0.14
9	230.0	8.4	3.6	5.4	8.6	160.4	0.14
10	225.0	8.2	3.5	5.4	9.2	159.5	0.14
11	220.0	8.1	3.5	5.4	9.9	158.1	0.14
12	215.0	8.0	3.5	5.4	10.5	157.2	0.15
13	210.0	7.9	3.5	5.4	11.2	155.8	0.15
14	205.0	7.8	3.5	5.4	12.0	154.8	0.15
15	200.0	7.6	3.5	5.3	12.8	153.3	0.15
16	195.0	7.5	3.5	5.3	13.6	152.3	0.15
17	190.0	7.4	3.4	5.3	14.4	150.9	0.15
18	185.0	7.2	3.4	5.2	15.4	149.8	0.15
19	180.0	7.1	3.4	5.2	16.4	148.3	0.15
20	175.0	7.0	3.4	5.2	17.5	146.6	0.16
21	170.0	6.8	3.4	5.1	18.6	145.0	0.16
22	165.0	6.7	3.3	5.1	19.8	143.9	0.16
23	160.0	6.6	3.3	5.1	21.1	142.2	0.16
24	155.0	6.4	3.3	5.0	22.5	141.0	0.16
25	150.0	6.3	3.2	4.9	24.0	139.3	0.16
26	145.0	6.2	3.2	4.8	25.5	138.1	0.16
27	140.0	6.0	3.2	4.7	27.1	136.2	0.17
28	135.0	5.9	3.1	4.6	28.9	135.6	0.17
29	130.0	5.7	3.1	4.5	30.7	133.7	0.17
30	125.0	5.6	3.1	4.3	32.8	132.4	0.17
31	120.0	5.4	3.0	4.2	35.0	130.4	0.17
32	115.0	5.3	3.0	4.1	37.2	129.0	0.17
33	110.0	5.1	2.9	4.0	39.6	126.9	0.17
34	105.0	5.0	2.9	3.9	42.4	125.4	0.17
35	100.0	4.8	2.8	3.7	45.4	123.2	0.17
36	95.0	4.6	2.8	3.6	48.6	121.7	0.17
37	90.0	4.5	2.7	3.5	52.0	119.3	0.17
38	85.0	4.3	2.6	3.4	55.6	117.7	0.17
39	80.0	4.1	2.6	3.2	59.3	115.1	0.17
40	75.0	4.0	2.5	3.1	63.4	113.3	0.17
41	70.0	3.8	2.4	3.0	67.4	110.5	0.16
42	65.0	3.6	2.4	2.8	71.8	108.6	0.16
43	60.0	3.4	2.3	2.7	76.0	105.5	0.16
44	55.0	3.2	2.3	2.5	80.3	103.3	0.15
45	50.0	3.0	2.2	2.4	84.1	99.8	0.15
46	45.0	2.8	2.1	2.2	87.8	97.3	0.14
47	40.0	2.6	2.0	2.0	91.0	93.3	0.13
48	35.0	2.4	1.9	1.9	93.8	90.3	0.13
49	30.0	2.2	1.7	1.7	96.0	85.5	0.12
50	25.0	1.9	1.5	1.5	97.7	81.9	0.11
51	20.0	1.6	1.3	1.3	98.8	75.9	0.09
52	15.0	1.3	1.0	1.0	99.6	71.0	0.08
53	10.0	1.0	0.8	0.8	99.9	61.0	0.06
54	5.0	0.5	0.4	0.4	100.0	49.9	0.04

4.8 Test Case 8

Test Case 8 uses an external Directional Wave Spectrum (DWS) input rather than a DWS that is internally generated using input wave parameters. The input DWS file was specified to provide a spectrum similar to earlier cases. Operation of the subroutine that reads an external DWS file and the subroutines that utilize data from this file are tested.

The subroutines called during execution of Test Case 8 are:

b_detail	b_head	balanceq	c_fine	c_gamma	c_in_dep
c_regrid	c_un	calc_hb3	calcroll	calcsurf	depdrvr
f2	f3	get_brk	get_diss	get_m	get_p
get_rhs	get_wave	gridout	gt_p	gt_sig_h	initlize
integrat	klong	lin_1	lin_2	lin_3	long1
main_wav	mdsrf1	mdsrf2	new_brk	percent	prt_out1
prt_out3	pt2	rad_st1	rad_st2	readspec	rn2
s_coeff	s_nosurf	s_tide	setup	shortout	slf_strt
srfsetup	summary	surf	surfcast	wavenum	weightfn
zone1					

The Depth Profile input file (medsand.dep) is provided in Appendix C to avoid repeating the contents of this file for each test case.

4.8.1 Test Case 8 Input File - Case8.in

```
case8.in                Line 1  - Input Filename
1998102714              Line 2  - Year Month Day
case 8 modified         Line 3  - Landing Zone Name
medsand.dep             Line 4  - Input Depth Profile File Name
case8.spc               Line 5  - Input Wave Spectrum File Name
None                    Line 6  - Input Wave Refraction File Name
315                     Line 7  - Compass Heading Toward Beach
                        Line 8  - Sediment Type
15                      Line 9  - Starting Depth
9999                    Line 10 - Offshore Wave Spectrum Depth
                        Line 11 - Sea and Swell Parameters
13 165 0                Line 12 - Wind Speed, Wind Direction, Tide Elevation
5                       Line 13 - Output Data Grid Spacing
```

4.8.2 Test Case 8 Input Directional Wave Spectrum File - Case8.spc

```
99.00000
99.00000
99.00000
         36
          6           6
         50
 5.000000
10.00000
          1
          1  4.9999999E-03  9.9999998E-03  1.5000000E-02
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
          2  1.5000000E-02  2.0000000E-02  2.4999999E-02
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
          3  2.4999999E-02  2.9999999E-02  3.5000000E-02
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
          4  3.5000000E-02  3.9999999E-02  4.4999998E-02
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
          5  4.4999998E-02  4.9999997E-02  5.4999996E-02
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
          6  5.5000000E-02  5.9999999E-02  6.4999998E-02
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
          7  6.4999998E-02  7.0000000E-02  7.5000003E-02
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
          8  7.4999996E-02  7.9999998E-02  8.5000001E-02
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
 0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
```

```
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
         9  8.4999993E-02  8.9999996E-02  9.4999999E-02
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        10  9.4999991E-02  9.9999994E-02  0.1050000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000016  0.00000020  0.00000025  0.00000031  0.00000035  0.00000039
0.00000043  6.65709543  6.65709543  0.00000045  0.00000043  0.00000039
0.00000035  0.00000031  0.00000025  0.00000020  0.00000016  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        11  0.1050000       0.1100000       0.1150000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00001766  0.00002309  0.00002885  0.00003461  0.00003999  0.00004465
0.00004824  0.00005052  0.00005129  0.00005052  0.00004824  0.00004465
0.00003999  0.00003461  0.00002885  0.00002309  0.00001766  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        12  0.1150000       0.1200000       0.1250000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00036283  0.00047440  0.00059267  0.00071087  0.00082155  0.00091720
0.00099105  0.00103769  0.00105363  0.00103769  0.00099105  0.00091720
0.00082155  0.00071087  0.00059267  0.00047440  0.00036283  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        13  0.1250000       0.1300000       0.1350000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00257384  0.00336530  0.00420424  0.00504276  0.00582785  0.00650640
0.00703026  0.00736109  0.00747421  0.00736109  0.00703026  0.00650640
0.00582785  0.00504276  0.00420424  0.00336530  0.00257384  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        14  0.1350000       0.1400000       0.1450000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00918630  0.01201111  0.01500541  0.01799816  0.02080025  0.02322205
0.02509177  0.02627256  0.02667629  0.02627256  0.02509177  0.02322205
0.02080025  0.01799816  0.01500541  0.01201111  0.00918630  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        15  0.1450000       0.1500000       0.1550000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.02086464  0.02728056  0.03408143  0.04087880  0.04724312  0.05274370
0.05699033  0.05967224  0.06058922  0.05967224  0.05699033  0.05274370
0.04724312  0.04087880  0.03408143  0.02728056  0.02086464  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        16  0.1550000       0.1600000       0.1650000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.03505900  0.04583972  0.05726727  0.06868894  0.07938296  0.08862560
0.09576127  0.10026769  0.10180851  0.10026769  0.09576127  0.08862560
0.07938296  0.06868894  0.05726727  0.04583972  0.03505900  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        17  0.1650000       0.1700000       0.1750000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.04806163  0.06284069  0.07850645  0.09416417  0.10882438  0.12149492
0.13127707  0.13745482  0.13956709  0.13745482  0.13127707  0.12149492
0.10882438  0.09416417  0.07850645  0.06284069  0.04806163  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
```

```
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        18  0.1750000       0.1800000       0.1850000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.05732813  0.07495665  0.09364286  0.11231945  0.12980621  0.14491968
0.15658787  0.16395673  0.16647626  0.16395673  0.15658787  0.14491968
0.12980621  0.11231945  0.09364286  0.07495665  0.05732813  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        19  0.1850000       0.1900000       0.1950000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.06211050  0.08120961  0.10145463  0.12168925  0.14063476  0.15700904
0.16965057  0.17763415  0.18036386  0.17763415  0.16965057  0.15700904
0.14063476  0.12168925  0.10145463  0.08120961  0.06211050  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        20  0.1950000       0.2000000       0.2050000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.06292575  0.08227555  0.10278632  0.12328653  0.14248073  0.15906993
0.17187738  0.17996576  0.18273132  0.17996576  0.17187738  0.15906993
0.14248073  0.12328653  0.10278632  0.08227555  0.06292575  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        21  0.2050000       0.2100000       0.2150000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.06081961  0.07952176  0.09934603  0.11916009  0.13771185  0.15374580
0.16612460  0.17394227  0.17661522  0.17394227  0.16612460  0.15374580
0.13771185  0.11916009  0.09934603  0.07952176  0.06081961  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        22  0.2150000       0.2200000       0.2250000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.05686688  0.07435356  0.09288944  0.11141576  0.12876183  0.14375371
0.15532801  0.16263758  0.16513683  0.16263758  0.15532801  0.14375371
0.12876183  0.11141576  0.09288944  0.07435356  0.05686688  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        23  0.2250000       0.2300000       0.2350000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.05194489  0.06791806  0.08484960  0.10177243  0.11761715  0.13131143
0.14188395  0.14856084  0.15084378  0.14856084  0.14188395  0.13131143
0.11761715  0.10177243  0.08484960  0.06791806  0.05194489  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        24  0.2350000       0.2400000       0.2450000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.04668070  0.06103510  0.07625077  0.09145860  0.10569758  0.11800405
0.12750512  0.13350539  0.13555698  0.13350539  0.12750512  0.11800405
0.10569758  0.09145860  0.07625077  0.06103510  0.04668070  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        25  0.2450000       0.2500000       0.2550000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.04147943  0.05423445  0.06775475  0.08126809  0.09392054  0.10485581
0.11329824  0.11862995  0.12045293  0.11862995  0.11329824  0.10485581
0.09392054  0.08126809  0.06775475  0.05423445  0.04147943  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        26  0.2550000       0.2600000       0.2650000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.03657798  0.04782578  0.05974845  0.07166497  0.08282232  0.09246543
0.09991025  0.10461193  0.10621951  0.10461193  0.09991025  0.09246543
0.08282232  0.07166497  0.05974845  0.04782578  0.03657798  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        27  0.2650000       0.2700000       0.2750000
```

```
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.03209699  0.04196689  0.05242896  0.06288566  0.07267618  0.08113796
0.08767075  0.09179645  0.09320708  0.09179645  0.08767075  0.08113796
0.07267618  0.06288566  0.05242896  0.04196689  0.03209699  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        28  0.2750000       0.2800000       0.2850000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.02808137  0.03671645  0.04586962  0.05501809  0.06358372  0.07098685
0.07670233  0.08031188  0.08154603  0.08031188  0.07670233  0.07098685
0.06358372  0.05501809  0.04586962  0.03671645  0.02808137  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        29  0.2850000       0.2900000       0.2950000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.02453088  0.03207419  0.04007007  0.04806184  0.05554448  0.06201159
0.06700444  0.07015759  0.07123571  0.07015759  0.06700444  0.06201159
0.05554448  0.04806184  0.04007007  0.03207419  0.02453088  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        30  0.2950000       0.3000000       0.3050000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.02141974  0.02800636  0.03498817  0.04196638  0.04850003  0.05414694
0.05850657  0.06125982  0.06220121  0.06125982  0.05850657  0.05414694
0.04850003  0.04196638  0.03498817  0.02800636  0.02141974  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        31  0.3050000       0.3100000       0.3150000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.01870949  0.02446270  0.03056110  0.03665635  0.04236329  0.04729570
0.05110370  0.05350859  0.05433086  0.05350859  0.05110370  0.04729570
0.04236329  0.03665635  0.03056110  0.02446270  0.01870949  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        32  0.3150000       0.3200000       0.3250000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.01635728  0.02138717  0.02671886  0.03204780  0.03703725  0.04134954
0.04467878  0.04678132  0.04750021  0.04678132  0.04467878  0.04134954
0.03703725  0.03204780  0.02671886  0.02138717  0.01635728  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        33  0.3250000       0.3300000       0.3350000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.01432018  0.01872367  0.02339135  0.02805664  0.03242472  0.03619996
0.03911459  0.04095529  0.04158465  0.04095529  0.03911459  0.03619996
0.03242472  0.02805664  0.02339135  0.01872367  0.01432018  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        34  0.3350000       0.3400000       0.3450000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.01255743  0.01641886  0.02051198  0.02460299  0.02843338  0.03174391
0.03429976  0.03591387  0.03646577  0.03591387  0.03429976  0.03174391
0.02843338  0.02460299  0.02051198  0.01641886  0.01255743  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        35  0.3450000       0.3500000       0.3550000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.01103228  0.01442473  0.01802072  0.02161486  0.02498003  0.02788848
0.03013391  0.03155199  0.03203685  0.03155199  0.03013391  0.02788848
0.02498003  0.02161486  0.01802072  0.01442473  0.01103228  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        36  0.3550000       0.3600000       0.3650000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00971197  0.01269843  0.01586406  0.01902807  0.02199051  0.02455089
```

```
0.02652759  0.02777596  0.02820279  0.02777596  0.02652759  0.02455089
0.02199051  0.01902807  0.01586406  0.01269843  0.00971197  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        37  0.3650000       0.3700000       0.3750000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00856787  0.01120250  0.01399522  0.01678649  0.01939994  0.02165870
0.02340255  0.02450385  0.02488040  0.02450385  0.02340255  0.02165870
0.01939994  0.01678649  0.01399522  0.01120250  0.00856787  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        38  0.3750000       0.3800000       0.3850000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00757492  0.00990422  0.01237328  0.01484107  0.01715164  0.01914863
0.02069038  0.02166405  0.02199696  0.02166405  0.02069038  0.01914863
0.01715164  0.01484107  0.01237328  0.00990422  0.00757492  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        39  0.3850000       0.3900000       0.3950000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00671194  0.00877588  0.01096365  0.01315029  0.01519763  0.01696711
0.01833321  0.01919595  0.01949093  0.01919595  0.01833321  0.01696711
0.01519763  0.01315029  0.01096365  0.00877588  0.00671194  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        40  0.3950000       0.4000000       0.4050000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00596038  0.00779321  0.00973600  0.01167780  0.01349589  0.01506723
0.01628036  0.01704650  0.01730845  0.01704650  0.01628036  0.01506723
0.01349589  0.01167780  0.00973600  0.00779321  0.00596038  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        41  0.4050000       0.4100000       0.4150000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00530468  0.00693588  0.00866496  0.01039314  0.01201122  0.01340970
0.01448938  0.01517123  0.01540437  0.01517123  0.01448938  0.01340970
0.01201122  0.01039314  0.00866496  0.00693588  0.00530468  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        42  0.4150000       0.4200000       0.4250000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00473133  0.00618623  0.00772841  0.00926981  0.01071300  0.01196033
0.01292331  0.01353147  0.01373941  0.01353147  0.01292331  0.01196033
0.01071300  0.00926981  0.00772841  0.00618623  0.00473133  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        43  0.4250000       0.4300000       0.4350000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00422913  0.00552960  0.00690809  0.00828588  0.00957589  0.01069082
0.01155159  0.01209519  0.01228106  0.01209519  0.01155159  0.01069082
0.00957589  0.00828588  0.00690809  0.00552960  0.00422913  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        44  0.4350000       0.4400000       0.4450000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00378813  0.00495299  0.00618774  0.00742186  0.00857735  0.00957602
0.01034703  0.01083395  0.01100043  0.01083395  0.01034703  0.00957602
0.00857735  0.00742186  0.00618774  0.00495299  0.00378813  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        45  0.4450000       0.4500000       0.4550000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00340015  0.00444570  0.00555398  0.00666170  0.00769884  0.00859523
0.00928727  0.00972432  0.00987376  0.00972432  0.00928727  0.00859523
0.00769884  0.00666170  0.00555398  0.00444570  0.00340015  0.00000000
```

```
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        46  0.4550000       0.4600000       0.4650000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00305808  0.00399844  0.00499523  0.00599150  0.00692430  0.00773051
0.00835293  0.00874600  0.00888041  0.00874600  0.00835293  0.00773051
0.00692430  0.00599150  0.00499523  0.00399844  0.00305808  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        47  0.4650000       0.4700000       0.4750000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00275580  0.00360322  0.00450148  0.00539927  0.00623987  0.00696639
0.00752729  0.00788151  0.00800263  0.00788151  0.00752729  0.00696639
0.00623987  0.00539927  0.00450148  0.00360322  0.00275580  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        48  0.4750000       0.4800000       0.4850000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00248820  0.00325332  0.00406436  0.00487497  0.00563394  0.00628991
0.00679634  0.00711617  0.00722553  0.00711617  0.00679634  0.00628991
0.00563394  0.00487497  0.00406436  0.00325332  0.00248820  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        49  0.4850000       0.4900000       0.4950000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00225070  0.00294280  0.00367642  0.00440966  0.00509619  0.00568954
0.00614763  0.00643694  0.00653585  0.00643694  0.00614763  0.00568954
0.00509619  0.00440966  0.00367642  0.00294280  0.00225070  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
        50  0.4950000       0.5000000       0.5050000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00203963  0.00266682  0.00333165  0.00399613  0.00461827  0.00515598
0.00557112  0.00583329  0.00592293  0.00583329  0.00557112  0.00515598
0.00461827  0.00399613  0.00333165  0.00266682  0.00203963  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
0.00000000  0.00000000  0.00000000  0.00000000  0.00000000  0.00000000
```

4.8.3 Test Case 8 Detailed Output File - Case8.out

```
      *****  *****  Surf Forecast  *****  *****
Navy Standard Surf Model     Version 3.1
Date and Time of Forecast:  10/27/1998   1400
Session Logged to file case8.out
Shallow Water Wave Refraction Only
Landing Zone Name                 = case 8 modified
Sight Line                  = 315.0 deg
Interval                    =   5.0 ft
Starting Depth              =  15.0 ft
Depth Profile File          =  medsand.dep
Spectrum File               =  case8.spc
Wind Speed                  =  13.0 kts
Wind Direction              = 165.0 deg
Tide Level                  =   0.0 ft
Internal grid spacing =  2.0 ft
Option : External Source Directional Wave Spectrum Used
Significant Wave Height Offshore =    3.6 ft
Significant Wave Height =    3.6 ft
Peak Frequency =    0.10 Hz
Zero-Crossing Frequency =    0.22 Hz
Peak Period =    10.0 sec
Percent of Breaking Waves is less than  5.0 %  at starting depth.
Self Starting option was selected.

    *****  *****  Coded Surf Forecast Follows  *****  *****
Significant Breaker Height                    alfa =    3.8 ft
Maximum Breaker Height                       bravo =    5.8 ft
Dominant Breaker Period                    charlie =   10.0 sec
Dominant Breaker Type                        delta = Spilling Surf
( 85% Spilling,  15% Plunging,   0% Surging)
Breaker Angle (toward right flank)            echo =    3.0 deg
Littoral Current (toward right flank)      foxtrot =    0.5 kts
Number of Surf Lines                         golf1 =    1.8
Surf Zone Width                              golf2 =  234.0 ft
Wind Speed                                  hotel1 =   13.0 kts
Wind Direction                              hotel2 =  165.0 deg
Modified Surf Index =      4.0

   *****  *****  Detailed Surf Output Follows  *****  *****
Indx   Dist    Water  Sig Brkr  Max Brkr  Prcnt  Wave   Littoral
     Offshore Depth   Height    Height    Brkng  Lngth  Current
       (ft)    (ft)    (ft)      (ft)     waves  (ft)    (kts)

  1   304.0    10.1    3.9       5.9      5.1   176.3    0.13
  2   299.0    10.0    3.9       5.9      5.4   175.2    0.15
  3   294.0     9.9    3.9       5.9      5.7   173.7    0.16
  4   289.0     9.7    3.9       5.9      6.0   172.9    0.17
  5   284.0     9.6    3.9       5.9      6.3   171.7    0.18
  6   279.0     9.5    3.9       5.9      6.7   171.0    0.19
  7   274.0     9.4    3.8       5.9      7.0   169.8    0.20
  8   269.0     9.3    3.8       5.9      7.4   169.0    0.21
  9   264.0     9.2    3.8       5.8      7.8   167.8    0.22
 10   259.0     9.1    3.8       5.8      8.2   166.9    0.23
 11   254.0     8.9    3.8       5.8      8.7   165.7    0.24
 12   249.0     8.8    3.8       5.8      9.1   164.9    0.25
 13   244.0     8.7    3.8       5.8      9.6   163.6    0.26
 14   239.0     8.6    3.8       5.7     10.1   162.7    0.27
```

15	234.0	8.5	3.7	5.7	10.7	161.4	0.28
16	229.0	8.3	3.7	5.7	11.2	160.5	0.29
17	224.0	8.2	3.7	5.7	11.8	159.1	0.30
18	219.0	8.1	3.7	5.6	12.4	158.2	0.30
19	214.0	8.0	3.7	5.6	13.1	156.9	0.31
20	209.0	7.9	3.6	5.6	13.7	156.0	0.32
21	204.0	7.7	3.6	5.5	14.5	154.0	0.33
22	199.0	7.6	3.6	5.5	15.2	153.0	0.34
23	194.0	7.5	3.6	5.5	16.0	151.6	0.35
24	189.0	7.3	3.5	5.4	16.8	150.6	0.36
25	184.0	7.2	3.5	5.4	17.7	149.1	0.37
26	179.0	7.1	3.5	5.3	18.6	148.0	0.38
27	174.0	6.9	3.4	5.3	19.6	146.4	0.39
28	169.0	6.8	3.4	5.2	20.6	145.3	0.39
29	164.0	6.7	3.4	5.2	21.7	144.2	0.40
30	159.0	6.5	3.3	5.1	22.8	143.1	0.41
31	154.0	6.4	3.3	5.0	24.0	141.4	0.42
32	149.0	6.3	3.3	4.9	25.2	140.2	0.42
33	144.0	6.1	3.2	4.8	26.5	138.5	0.43
34	139.0	6.0	3.2	4.7	27.9	137.3	0.44
35	134.0	5.8	3.1	4.6	29.4	135.4	0.44
36	129.0	5.7	3.1	4.4	31.0	134.1	0.45
37	124.0	5.5	3.0	4.3	32.8	132.2	0.45
38	119.0	5.4	3.0	4.2	34.6	130.8	0.46
39	114.0	5.2	2.9	4.1	36.5	128.8	0.46
40	109.0	5.1	2.9	4.0	38.6	127.4	0.47
41	104.0	4.9	2.8	3.8	41.1	125.2	0.47
42	99.0	4.8	2.8	3.7	43.7	123.7	0.47
43	94.0	4.6	2.7	3.6	46.4	121.5	0.47
44	89.0	4.4	2.6	3.5	49.4	119.9	0.47
45	84.0	4.3	2.6	3.3	52.9	117.4	0.47
46	79.0	4.1	2.5	3.2	56.3	115.7	0.47
47	74.0	3.9	2.4	3.1	59.8	113.0	0.46
48	69.0	3.8	2.4	2.9	63.3	111.2	0.46
49	64.0	3.6	2.3	2.8	67.3	108.3	0.45
50	59.0	3.4	2.2	2.6	71.5	106.2	0.44
51	54.0	3.2	2.2	2.5	75.8	102.9	0.43
52	49.0	3.0	2.1	2.3	80.0	100.6	0.41
53	44.0	2.8	2.0	2.2	84.3	96.9	0.40
54	39.0	2.6	2.0	2.0	88.2	94.2	0.38
55	34.0	2.3	1.8	1.8	91.7	89.7	0.36
56	29.0	2.1	1.6	1.6	94.6	86.5	0.33
57	24.0	1.8	1.4	1.4	96.9	81.1	0.30
58	19.0	1.6	1.2	1.2	98.4	76.9	0.27
59	14.0	1.3	1.0	1.0	99.5	69.6	0.22
60	9.0	0.9	0.7	0.7	99.9	62.2	0.17

4.8.4 Test Case 8 Summary Output File – Case8.dat

1	304.0	10.1	3.9	5.9	5.1	176.3	0.13
2	299.0	10.0	3.9	5.9	5.4	175.2	0.15
3	294.0	9.9	3.9	5.9	5.7	173.7	0.16
4	289.0	9.7	3.9	5.9	6.0	172.9	0.17
5	284.0	9.6	3.9	5.9	6.3	171.7	0.18
6	279.0	9.5	3.9	5.9	6.7	171.0	0.19
7	274.0	9.4	3.8	5.9	7.0	169.8	0.20
8	269.0	9.3	3.8	5.9	7.4	169.0	0.21
9	264.0	9.2	3.8	5.8	7.8	167.8	0.22
10	259.0	9.1	3.8	5.8	8.2	166.9	0.23
11	254.0	8.9	3.8	5.8	8.7	165.7	0.24
12	249.0	8.8	3.8	5.8	9.1	164.9	0.25
13	244.0	8.7	3.8	5.8	9.6	163.6	0.26
14	239.0	8.6	3.8	5.7	10.1	162.7	0.27
15	234.0	8.5	3.7	5.7	10.7	161.4	0.28
16	229.0	8.3	3.7	5.7	11.2	160.5	0.29
17	224.0	8.2	3.7	5.7	11.8	159.1	0.30
18	219.0	8.1	3.7	5.6	12.4	158.2	0.30
19	214.0	8.0	3.7	5.6	13.1	156.9	0.31
20	209.0	7.9	3.6	5.6	13.7	156.0	0.32
21	204.0	7.7	3.6	5.5	14.5	154.0	0.33
22	199.0	7.6	3.6	5.5	15.2	153.0	0.34
23	194.0	7.5	3.6	5.5	16.0	151.6	0.35
24	189.0	7.3	3.5	5.4	16.8	150.6	0.36
25	184.0	7.2	3.5	5.4	17.7	149.1	0.37
26	179.0	7.1	3.5	5.3	18.6	148.0	0.38
27	174.0	6.9	3.4	5.3	19.6	146.4	0.39
28	169.0	6.8	3.4	5.2	20.6	145.3	0.39
29	164.0	6.7	3.4	5.2	21.7	144.2	0.40
30	159.0	6.5	3.3	5.1	22.8	143.1	0.41
31	154.0	6.4	3.3	5.0	24.0	141.4	0.42
32	149.0	6.3	3.3	4.9	25.2	140.2	0.42
33	144.0	6.1	3.2	4.8	26.5	138.5	0.43
34	139.0	6.0	3.2	4.7	27.9	137.3	0.44
35	134.0	5.8	3.1	4.6	29.4	135.4	0.44
36	129.0	5.7	3.1	4.4	31.0	134.1	0.45
37	124.0	5.5	3.0	4.3	32.8	132.2	0.45
38	119.0	5.4	3.0	4.2	34.6	130.8	0.46
39	114.0	5.2	2.9	4.1	36.5	128.8	0.46
40	109.0	5.1	2.9	4.0	38.6	127.4	0.47
41	104.0	4.9	2.8	3.8	41.1	125.2	0.47
42	99.0	4.8	2.8	3.7	43.7	123.7	0.47
43	94.0	4.6	2.7	3.6	46.4	121.5	0.47
44	89.0	4.4	2.6	3.5	49.4	119.9	0.47
45	84.0	4.3	2.6	3.3	52.9	117.4	0.47
46	79.0	4.1	2.5	3.2	56.3	115.7	0.47
47	74.0	3.9	2.4	3.1	59.8	113.0	0.46
48	69.0	3.8	2.4	2.9	63.3	111.2	0.46
49	64.0	3.6	2.3	2.8	67.3	108.3	0.45
50	59.0	3.4	2.2	2.6	71.5	106.2	0.44
51	54.0	3.2	2.2	2.5	75.8	102.9	0.43
52	49.0	3.0	2.1	2.3	80.0	100.6	0.41
53	44.0	2.8	2.0	2.2	84.3	96.9	0.40
54	39.0	2.6	2.0	2.0	88.2	94.2	0.38
55	34.0	2.3	1.8	1.8	91.7	89.7	0.36
56	29.0	2.1	1.6	1.6	94.6	86.5	0.33
57	24.0	1.8	1.4	1.4	96.9	81.1	0.30

58	19.0	1.6	1.2	1.2	98.4	76.9	0.27
59	14.0	1.3	1.0	1.0	99.5	69.6	0.22
60	9.0	0.9	0.7	0.7	99.9	62.2	0.17

4.9 Test Case 9

Test Case 9 uses an external depth file, Directional Wave Spectrum (DWS) file, and refraction file. These input files are similar to those used in earlier test cases. This test case exercises several interpolation subroutines including cubpoly, genrlspl, and spline to create a directional wave spectrum and a shoaling/refraction transfer function that are defined within the same frequency bands and wave directions. In addition, the option to print the output directional wave spectrum is exercised because the offshore water depth is a negative number.

The subroutines called during execution of Test Case 9 are:

b_detail	b_head	balanceq	c_fine	c_gamma	c_in_dep
c_regrid	cubpoly	c_un	calc_hb3	calcroll	calcsurf
depdrvr	f2	f3	genrlspl	get_brk	get_diss
get_m	get_p	get_rhs	get_wave	gridout	gt_p
gt_sig_h	initlize	integrat	klong	lin_1	lin_2
lin_3	long1	main_wav	mdsrf1	mdsrf2	new_brk
percent	prt_out1	prt_out3	pt2	rad_st1	rad_st2
readrfrc	readspec	rn2	s_coeff	s_nosurf	spline
s_tide	setup	shortout	slf_strt	srfsetup	summary
surf	surfcast	wavenum	weightfn	zone1	

The Depth Profile input file (medsand.dep) is provided in Appendix C to avoid repeating the contents of this file for each test case.

4.9.1 Test Case 9 Input File – Case9.in

```
case9.in                Line 1  - Input Filename
1998102714              Line 2  - Year Month Day
case 9 modified         Line 3  - Landing Zone Name
medsand.dep             Line 4  - Input Depth Profile File Name
case8.spc               Line 5  - Input Wave Spectrum File Name
case7.ref               Line 6  - Input Wave Refraction File Name
315                     Line 7  - Compass Heading Toward Beach
                        Line 8  - Sediment Type
15                      Line 9  - Starting Depth
-9999                   Line 10 - Offshore Wave Spectrum Depth
                        Line 11 - Sea and Swell Parameters
13 165 0                Line 12 - Wind Speed, Wind Direction, Tide Elevation
5                       Line 13 - Output Data Grid Spacing
```

4.9.2 Test Case 9 Detailed Output File – Case9.out

```
      *****  *****  Surf Forecast  *****  *****
Navy Standard Surf Model     Version 3.1
Date and Time of Forecast:  10/27/1998   1400
Session Logged to file case9.out
Wave Refraction File        = case7.ref
Landing Zone                = case 8 modified
Sight Line                  = 315.0 deg
Interval                    =   5.0 ft
Starting Depth              =  15.0 ft
Depth Profile File          =  medsand.dep
Spectrum File               =  case8.spc
Wind Speed                  =  13.0 kts
Wind Direction              = 165.0 deg
Tide Level                  =   0.0 ft
Internal grid spacing =  2.0 ft
Option : External Source Directional Wave Spectrum Used
Significant Wave Height Offshore =    3.2 ft
Significant Wave Height =    3.2 ft
Peak Frequency =    0.10 Hz
Zero-Crossing Frequency =    0.17 Hz
Peak Period =    10.0 sec
Percent of Breaking Waves is less than  5.0 %  at starting depth.
Self Starting option was selected.

    *****  *****  Coded Surf Forecast Follows  *****  *****
 Significant Breaker Height                      alfa =    3.5 ft
 Maximum Breaker Height                         bravo =    5.4 ft
 Dominant Breaker Period                      charlie =   10.0 sec
 Dominant Breaker Type                          delta = Spilling Surf
 ( 79% Spilling,  21% Plunging,   0% Surging)
 Breaker Angle (toward right flank)              echo =    0.9 deg
 Littoral Current (toward right flank)        foxtrot =    0.2 kts
 Number of Surf Lines                           golf1 =    1.7
 Surf Zone Width                                golf2 =  212.0 ft
 Wind Speed                                     hotel1 =   13.0 kts
 Wind Direction                                 hotel2 =  165.0 deg
 Modified Surf Index =      3.3

   *****  *****  Detailed Surf Output Follows  *****  *****
Indx   Dist    Water  Sig Brkr  Max Brkr  Prcnt  Wave   Littoral
     Offshore Depth   Height    Height    Brkng  Lngth  Current
       (ft)    (ft)    (ft)      (ft)     waves  (ft)    (kts)

  1   270.0     9.3    3.6       5.5      5.1    169.7    0.13
  2   265.0     9.2    3.6       5.5      5.5    168.1    0.14
  3   260.0     9.1    3.6       5.5      5.9    166.9    0.14
  4   255.0     9.0    3.6       5.5      6.3    166.1    0.14
  5   250.0     8.9    3.6       5.5      6.7    164.8    0.14
  6   245.0     8.7    3.6       5.5      7.1    164.0    0.14
  7   240.0     8.6    3.6       5.5      7.6    162.6    0.14
  8   235.0     8.5    3.6       5.5      8.1    161.8    0.14
  9   230.0     8.4    3.6       5.4      8.6    160.4    0.14
 10   225.0     8.2    3.5       5.4      9.2    159.5    0.14
 11   220.0     8.1    3.5       5.4      9.9    158.1    0.14
 12   215.0     8.0    3.5       5.4     10.5    157.2    0.15
 13   210.0     7.9    3.5       5.4     11.2    155.8    0.15
 14   205.0     7.8    3.5       5.4     11.9    154.8    0.15
```

15	200.0	7.6	3.5	5.3	12.8	153.3	0.15
16	195.0	7.5	3.5	5.3	13.6	152.3	0.15
17	190.0	7.4	3.4	5.3	14.4	150.9	0.15
18	185.0	7.2	3.4	5.2	15.4	149.8	0.15
19	180.0	7.1	3.4	5.2	16.4	148.3	0.15
20	175.0	7.0	3.4	5.2	17.5	146.6	0.16
21	170.0	6.8	3.4	5.1	18.6	145.0	0.16
22	165.0	6.7	3.3	5.1	19.8	143.9	0.16
23	160.0	6.6	3.3	5.1	21.1	142.2	0.16
24	155.0	6.4	3.3	5.0	22.5	141.0	0.16
25	150.0	6.3	3.2	4.9	24.0	139.3	0.16
26	145.0	6.2	3.2	4.8	25.5	138.1	0.16
27	140.0	6.0	3.2	4.7	27.1	136.2	0.17
28	135.0	5.9	3.1	4.6	28.9	135.6	0.17
29	130.0	5.7	3.1	4.5	30.7	133.7	0.17
30	125.0	5.6	3.1	4.3	32.8	132.4	0.17
31	120.0	5.4	3.0	4.2	35.0	130.4	0.17
32	115.0	5.3	3.0	4.1	37.2	129.0	0.17
33	110.0	5.1	2.9	4.0	39.6	126.9	0.17
34	105.0	5.0	2.9	3.9	42.4	125.4	0.17
35	100.0	4.8	2.8	3.7	45.4	123.2	0.17
36	95.0	4.6	2.8	3.6	48.6	121.7	0.17
37	90.0	4.5	2.7	3.5	52.0	119.3	0.17
38	85.0	4.3	2.6	3.4	55.6	117.7	0.17
39	80.0	4.1	2.6	3.2	59.3	115.1	0.17
40	75.0	4.0	2.5	3.1	63.4	113.3	0.17
41	70.0	3.8	2.4	3.0	67.4	110.5	0.16
42	65.0	3.6	2.4	2.8	71.8	108.6	0.16
43	60.0	3.4	2.3	2.7	76.0	105.5	0.16
44	55.0	3.2	2.3	2.5	80.3	103.3	0.15
45	50.0	3.0	2.2	2.4	84.1	99.8	0.15
46	45.0	2.8	2.1	2.2	87.8	97.3	0.14
47	40.0	2.6	2.0	2.0	91.0	93.3	0.13
48	35.0	2.4	1.9	1.9	93.8	90.3	0.13
49	30.0	2.2	1.7	1.7	96.0	85.5	0.12
50	25.0	1.9	1.5	1.5	97.7	81.9	0.11
51	20.0	1.6	1.3	1.3	98.8	75.9	0.09
52	15.0	1.3	1.0	1.0	99.6	71.0	0.08
53	10.0	1.0	0.8	0.8	99.9	61.0	0.06
54	5.0	0.5	0.4	0.4	100.0	49.9	0.04

4.9.3 Test Case 9 Summary Output File – Case9.dat

1	270.0	9.3	3.6	5.5	5.1	169.7	0.13
2	265.0	9.2	3.6	5.5	5.5	168.1	0.14
3	260.0	9.1	3.6	5.5	5.9	166.9	0.14
4	255.0	9.0	3.6	5.5	6.3	166.1	0.14
5	250.0	8.9	3.6	5.5	6.7	164.8	0.14
6	245.0	8.7	3.6	5.5	7.1	164.0	0.14
7	240.0	8.6	3.6	5.5	7.6	162.6	0.14
8	235.0	8.5	3.6	5.5	8.1	161.8	0.14
9	230.0	8.4	3.6	5.4	8.6	160.4	0.14
10	225.0	8.2	3.5	5.4	9.2	159.5	0.14
11	220.0	8.1	3.5	5.4	9.9	158.1	0.14
12	215.0	8.0	3.5	5.4	10.5	157.2	0.15
13	210.0	7.9	3.5	5.4	11.2	155.8	0.15
14	205.0	7.8	3.5	5.4	11.9	154.8	0.15
15	200.0	7.6	3.5	5.3	12.8	153.3	0.15
16	195.0	7.5	3.5	5.3	13.6	152.3	0.15
17	190.0	7.4	3.4	5.3	14.4	150.9	0.15
18	185.0	7.2	3.4	5.2	15.4	149.8	0.15
19	180.0	7.1	3.4	5.2	16.4	148.3	0.15
20	175.0	7.0	3.4	5.2	17.5	146.6	0.16
21	170.0	6.8	3.4	5.1	18.6	145.0	0.16
22	165.0	6.7	3.3	5.1	19.8	143.9	0.16
23	160.0	6.6	3.3	5.1	21.1	142.2	0.16
24	155.0	6.4	3.3	5.0	22.5	141.0	0.16
25	150.0	6.3	3.2	4.9	24.0	139.3	0.16
26	145.0	6.2	3.2	4.8	25.5	138.1	0.16
27	140.0	6.0	3.2	4.7	27.1	136.2	0.17
28	135.0	5.9	3.1	4.6	28.9	135.6	0.17
29	130.0	5.7	3.1	4.5	30.7	133.7	0.17
30	125.0	5.6	3.1	4.3	32.8	132.4	0.17
31	120.0	5.4	3.0	4.2	35.0	130.4	0.17
32	115.0	5.3	3.0	4.1	37.2	129.0	0.17
33	110.0	5.1	2.9	4.0	39.6	126.9	0.17
34	105.0	5.0	2.9	3.9	42.4	125.4	0.17
35	100.0	4.8	2.8	3.7	45.4	123.2	0.17
36	95.0	4.6	2.8	3.6	48.6	121.7	0.17
37	90.0	4.5	2.7	3.5	52.0	119.3	0.17
38	85.0	4.3	2.6	3.4	55.6	117.7	0.17
39	80.0	4.1	2.6	3.2	59.3	115.1	0.17
40	75.0	4.0	2.5	3.1	63.4	113.3	0.17
41	70.0	3.8	2.4	3.0	67.4	110.5	0.16
42	65.0	3.6	2.4	2.8	71.8	108.6	0.16
43	60.0	3.4	2.3	2.7	76.0	105.5	0.16
44	55.0	3.2	2.3	2.5	80.3	103.3	0.15
45	50.0	3.0	2.2	2.4	84.1	99.8	0.15
46	45.0	2.8	2.1	2.2	87.8	97.3	0.14
47	40.0	2.6	2.0	2.0	91.0	93.3	0.13
48	35.0	2.4	1.9	1.9	93.8	90.3	0.13
49	30.0	2.2	1.7	1.7	96.0	85.5	0.12
50	25.0	1.9	1.5	1.5	97.7	81.9	0.11
51	20.0	1.6	1.3	1.3	98.8	75.9	0.09
52	15.0	1.3	1.0	1.0	99.6	71.0	0.08
53	10.0	1.0	0.8	0.8	99.9	61.0	0.06
54	5.0	0.5	0.4	0.4	100.0	49.9	0.04

4.9.4 Test Case 9 Output Directional Wave Spectrum File – Case9.dws

```
    0.00    0.0100    0.0200    0.0300    0.0400    0.0500    0.0600    0.0700
   0.0800    0.0900    0.1000    0.1100    0.1200    0.1300    0.1400
0.1500    0.1600    0.1700    0.1800    0.1900    0.2000    0.2100    0.2200
  0.2300    0.2400    0.2500    0.2600    0.2700    0.2800    0.2900    0.3000
   0.3100    0.3200    0.3300    0.3400    0.3500    0.3600    0.3700
0.3800    0.3900    0.4000    0.4100    0.4200    0.4300    0.4400    0.4500
  0.4600    0.4700    0.4800    0.4900    0.5000
  5.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000
 15.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000
 25.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000
 35.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000
 45.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000
 55.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000
 65.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
  0.0000    0.0000    0.0000    0.0000    0.0000
```

75.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0210 0.0194 0.0454 0.0408 0.0362
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000
85.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0000 0.0001 0.0005
0.0011 0.0019 0.0026 0.0031 0.0000 0.0000 0.0000 0.0693
0.0665 0.0630 0.0589 0.0336 0.0306 0.0370 0.0328 0.0290
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
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0.0641 0.0597 0.0550 0.1083 0.0932 0.0461 0.0408 0.0359
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105.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
0.0000 0.0000 0.0000 0.0000 0.0003 0.0031 0.0213
0.0472 0.0526 0.1242 0.1464 0.1576 0.1598 0.0887 0.0838
0.0778 0.1570 0.1418 0.0692 0.0658 0.0585 0.0518 0.0456
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0.0737 0.1204 0.0898 0.1051 0.1123 0.1130 0.2352 0.2204
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0.1027 0.1669 0.2223 0.2591 0.2757 0.2760 0.1390 0.1297
0.1188 0.1074 0.0962 0.0856 0.0759 0.0670 0.0590 0.0517
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0.0573 0.0929 0.1235 0.1437 0.1528 0.1527 0.1464 0.1365
0.1250 0.1129 0.1011 0.0899 0.0797 0.0703 0.0618 0.0542
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325.0000   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
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335.0000   0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
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   0.0000    0.0000    0.0000    0.0000    0.0000
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5.0 NOTES

5.1 SURF 3.1 Input File Formats

5.1.1 SURF 3.1 Input File

Line	Description	Type	Units	Range
Line 1	Input File Name	Char*40	-----	-----
Line 2	Date and Time (YYYYMMDDHH)	Char*10	-----	-----
Line 3	Landing Zone Name	Char*40	-----	-----
Line 4	Input Depth Profile File Name	Char*40	*.*	-----
Line 5	Input Wave Spectrum File Name	Char*40	*.*	-----
Line 6	Input Wave Refraction File Name	Char*40	*.*	-----
Line 7	Compass Heading Toward Beach	Real	Degrees	0-359
Line 8	Slope/Sediment Type	Integer	-----	1-10
	1 = Boulders	6 = Coarse Sand		
	2 = Cobble	7 = Medium Sand		
	3 = Pebbles	8 = Fine Sand		
	4 = Granules	9 = Very Fine Sand		
	5 = Very Coarse Sand	10 = Silt		
Line 9	Starting Depth	Real	Feet	> 0
Line 10	Offshore Wave Spectrum Depth	Real	Feet	> 0
Line 11	Sea Wave Height	Real	Feet	> 0
	Sea Wave Period	Real	Seconds	1 - 30
	Sea Wave Direction	Real	Degrees	0 - 359
	Swell Wave Height	Real	Feet	> 0
	Swell Wave Period	Real	Seconds	1 - 30
	Swell Wave Direction	Real	Degrees	0 - 359
Line 12	Wind Speed	Real	Knots	> 0
	Wind Direction	Real	Degrees	0 - 359
	Tide Elevation	Real	Feet	+ or -
Line 13	Output Data Grid Spacing	Real	Feet	> 0

* The input file name (line 1) must always be included.

** If any of the above input data is not included or not available, insert a blank or a blank line for character and/or numeric data to maintain a consistent format in the input file.

*** The above format is for the default model setup, for more detailed information read the advanced user options information in section 5.1.5.

5.1.2 Input Depth Profile File

Line	Description	Type	Range
Line 1	Title	Char*80	---------
Line 2	Units for Distance Offshore 1 - Distances in Feet 2 - Distances in Meters 3 - Distances in Yards	Integer	1,2,or 3
Line 3	Units for Depth 1 - Depths in Feet 2 - Depths in Meters 3 - Depths in Fathoms	Integer	1,2,or 3
Line 4 - EOF	Point Number	Integer	1 - 500
	Distance (+) Positive numbers are Offshore (-) Negative numbers are Onshore	Real	+ or -
	Depth (+) Positive numbers are Depths (-) Negative numbers are Elevations	Real	+ or -

5.1.3 Wave Refraction File

Line	Description	Type	Units	Range
Line 1	Longitude	Real	Degrees	-180 - +180
Line 2	Latitude	Real	Degrees	-90 - +90
Line 3	Date (YYYYDDMM)	Real	-----	----
Line 4	Number of Angles	Integer	-----	1 - 180
Line 5	Number of Rows	Integer	-----	+ number
	Number of Columns	Integer	-----	+ number
Line 6	Number of Frequency Bins	Integer	-----	1 - 50
Line 7	Initial Direction	Real	Degrees	0 - 359
Line 8	Initial Frequency Bin	Real	Degrees	0 - 359
Line 9	Width of Direction Bin	Real	Degrees	2 - 180
Line 10	Direction of Waves	Integer	-----	1 or 2
	1 - Direction waves are coming from			
	2 - Direction waves are going to			
Angle Refraction Coefficients - This section is repeated for each Frequency Bin				
Line	Bin Number	Integer	-----	1 - 50
	Lower Limit of Frequency Bin	Real	Hertz	> = 0
	Center of Frequency Bin	Real	Hertz	> = 0
	Upper Limit of Frequency Bin	Real	Hertz	> = 0
Line	Angle Refraction Coefficients	Real	Degrees	0 - 359
	The coefficients are in the format:			
	(Number of Rows by Number of Columns). All rows and columns must contain numbers; pad fields with zeros, if necessary.			
End of Angle Refraction Coefficients Section				
Line	Header 1 for Shoaling Coefficients	Char*80	-----	-----
Line	Header 2 for Shoaling Coefficients	Char*80	-----	-----
Line	Header 3 for Shoaling Coefficients	Char*80	-----	-----
Shoaling Coefficients - This section is repeated for each Frequency Bin				
Line	Bin Number	Integer	-----	1 - 50
	Lower Limit of Frequency Bin	Real	Hertz	> = 0
	Center of Frequency Bin	Real	Hertz	> = 0
	Upper Limit of Frequency Bin	Real	Hertz	> = 0
Line	Shoaling Coefficients	Real	$(N/m)^2$	
	The coefficients are in the format:			
	(Number of Rows by Number of Columns). All rows and columns must contain numbers; pad fields with zeros, if necessary.			
End of Shoaling Coefficients Section				

* The coefficients in this file must be defined over the entire 0 to 360 degree range. A partial sector definition (e.g. 0 to 180 degrees) will cause errors. If the input data is not available over the entire range, pad the direction bins with zeros.

5.1.4 Spectrum File

Line	Description	Type	Units	Range
Line 1	Longitude	Real	Degrees	-180 - +180
Line 2	Latitude	Real	Degrees	-90 - +90
Line 3	Date - (YYYYMMDD)	Real	-----	----
Line 4	Number of Angles	Integer	-----	1 - 180
Line 5	Number of Rows	Integer	-----	+ number
	Number of Columns	Integer	-----	+ number
Line 6	Number of Frequency Bins	Integer	-----	1 - 50
Line 7	Initial Direction	Real	Degrees	0 - 359
Line 8	Initial Frequency Bin	Real	Hertz	>= 0
Line 9	Width of Direction Bin	Real	Degrees	2 - 180
Line 10	Direction of Waves	Integer	-----	1 or 2
	1 - Direction waves are coming from			
	2 - Direction waves are going to			

Directional Wave Spectrum - This section is repeated for each Frequency Bin

Line	Bin Number	Integer	-----	1 - 50
	Lower Limit of Frequency Bin	Real	Hertz	>= 0
	Center of Frequency Bin	Real	Hertz	>= 0
	Upper Limit of Frequency Bin	Real	Hertz	>= 0
Line	Directional Wave Spectrum	Real >	$(\frac{m^2}{Hz * Radians})$	>= 0

The Number of Angles are in the format:
(Number of Rows by Number of Columns)
All rows and columns must contain numbers; pad fields with zeros, if necessary.

End of Directional Wave Spectrum Section

* The coefficients in this file must be defined over the entire 0 to 360 degree range. A partial sector definition (e.g. 0 to 180 degrees) will cause errors. If the input data is not available over the entire range, pad the direction bins with zeros.

5.1.5 Advanced SURF 3.1 Model Options

Several run-time model options included in Surf 3.1 are transparent to the user. These options are reserved for the advanced or expert user applying the model to unique situations. The default input settings are appropriate for most model runs. However, if necessary the user can control the wave refraction and the amount of output data including the production of an additional file with a shallow water wave spectrum after transformation due to shoaling and refraction. These options are not recommended for most users.

Wave Refraction Option

The default wave refraction setting uses linear wave theory and Snell's Law to refract waves with a straight coast assumption. A coast is assumed straight if the bottom contours are straight and generally parallel with the coastline. Line 6 in the input file is used to specify an externally generated wave refraction file that includes refraction and shoaling coefficients. Programs such as REFDIF and STWAVE can be used to calculate these types of coefficients. If an expert user wants to ignore all refraction effects Line 6 must contain the word *none* or *NONE*. This option is not recommended for most users.

Self-Start Option

The model is typically configured to use the self-start option. This option expedites model execution by shoaling and refracting the offshore wave spectrum to the starting depth specified in Line 9 of the input file. The model then begins stepwise calculations from this point shoreward. There are two advanced user options associated with the starting depth. These options are selected by using a negative number or a zero in Line 9 of the input file.

If Line 9 of the input file contains a negative number the self-start option will not be used and the data written to the output file will begin at the absolute value of the starting depth specified in Line 9. For example, if Line 9 in the input file is -15, then the self-start option will not be used and the columnar data in the output file will begin at a water depth of 15 feet. If Line 9 is a zero the self start option will not be used and calculations will begin at the farthest point offshore as defined in the input depth file or the constructed equilibrium depth profile.

Wave Spectrum Depth Option

Line 10 of the input file is used to specify the water depth at the input directional wave spectrum. If this value is left blank or is defined as zero, the model will assume that the wave spectrum is located in deep water. If Line 10 of the input file is a negative number, an additional output file is created with the shallow water directional wave spectrum at the depth specified in Line 9, the starting depth. This wave spectrum has been shoaled and refracted to the starting depth. The format of this ASCII text file is a simple matrix of rows and columns. It has the same name as the output file except that the file extension will be *.dws. The first row contains the center frequency bin definitions and the first column defines the wave direction bins. The heart of the matrix is the wave energy per frequency and direction with the units m^2/Hz*radians. This spectrum has the same units as the input directional wave spectrum so that direct comparisons can be made. This option is available for users interested in examining the transformation of the directional wave spectrum in shallow water.

Detailed Output Option

The final advanced user option controls the amount of data in the output file. The default option will create an output file with the detailed output of columnar data of many wave parameters across the surf zone. The distance between each of these points is defined by Line 13 in the input file. If Line 13 is zero or a negative number, only the summary of the wave parameters in the coded surf forecast will be reported in the output file excluding the detailed output.

5.2 SURF 3.1 Output File Formats

5.2.1 SURF 3.1 Detailed Output File

The SURF Detailed Output has three output sections delineated by asterisks. The first section contains the input parameters and several variables describing the directional wave spectrum. The second section is the coded surf forecast with variables specific to military surf observations. The final section is the detailed surf output, which is columnar data describing cross-shore distributions of several variables including wave height, water depth, wave breaking, and longshore current. The filename generated is "*.out", where the "*" is replaced with the prefix of the input file name.

Line	Description	Type	Units
Line 1	Surf Header	Character	-----
Line 2	Blank Line	Character	-----
Line 3	SURF Model Version	Character	-----
Line 4	Date and Time of Forecast	Character	-----
Line 5	Output File Name Information	Character	-----
Line 6	Straight Coast Wave Refraction Option	Character	-----
Line 7	Landing Zone Name	Character	-----
Line 8	Sight Line Toward Beach	Real	Degrees
Line 9	Interval	Real	Feet
Line 10	Starting Depth	Real	Feet
Line 11	Depth Profile Name or Beach Sediment Type	Character	-----
Line 12	Spectrum Usage Text	Character	-----
	Or		
	Sea Wave Height	Real	Feet
	Sea Period	Real	Seconds
	Sea Direction	Real	Degrees
Line 13	Spectrum File Name	Character	-----
	Or		
	Swell Wave Height	Real	Feet
	Swell Period	Real	Seconds
	Swell Direction	Real	Degrees
Line 14	Wind Speed	Real	Knots
Line 15	Wind Direction	Real	Degrees
Line 16	Tide Level	Real	Feet

Line	Description	Type	Units
Line 17	Blank Line	Character	-----
Line 18	Internal Grid Spacing	Real	Feet
Line 19	Significant Wave Height from Input File	Real	Feet
Line 20	Significant Wave Height from Straight Coast	Real	Feet
Line 21	Input Spectrum Type	Integer	-----
Line 22	Significant Wave Height Offshore	Real	Feet
Line 23	Stress Significant Wave Height	Real	Feet
Line 24	Stress Peak Frequency	Real	Hertz
Line 25	Stress Zero-Crossing Frequency	Real	Hertz
Line 26	Stress Peak Period	Real	Seconds
Line 27	Percentage Breaking Waves at Starting Depth	Real	Percent
Line 28	Self Starting Option	Character	-----
Line 29	Blank Line	Character	-----
Line 30	Text Heading - Surf Forecast	Character	-----
Line 31	Significant Breaker Height	Real	Feet
Line 32	Maximum Breaker Height	Real	Feet
Line 33	Dominant Breaker Period	Real	Seconds
Line 34	Dominant Breaker Type	Character	-----
Line 35	Breaker Percentages	Character	Percent
Line 36	Breaker Angle	Real	Degrees
Line 37	Littoral Current	Real	Knots
Line 38	Number of Surf Lines	Real	-----
Line 39	Surf Zone Width	Real	Feet
Line 40	Wind Speed	Real	Knots
Line 41	Wind Direction	Real	Degrees
Line 42	Blank Line	Character	-----
Line 43	Modified Surf Index	Real	-----
Line 44	Blank Line	Character	-----
Line 45	Text Heading - Detailed Surf Output	Character	-----
Line 46	Blank Line	Character	-----
Line 47	Text Heading Line	Character	-----
Line 48	Text Heading Line	Character	-----
Line 49	Text Heading Line - Units	Character	-----
Line 50	Blank Line	Character	-----
Line 51 -EOF	Index Number	Integer	-----
	Distance Offshore	Real	Feet
	Water Depth	Real	Feet
	Significant Breaker Height	Real	Feet
	Maximum Breaker Height	Real	Feet
	Percent Breaking Waves	Real	Percent
	Wave Length	Real	Feet
	Littoral Current	Real	Knots

5.2.2 SURF 3.1 Summary Output File

The SURF Summary Output File is in the same format as the Detailed Surf Output file in the preceding section without the Detailed output at the end of the file. The filename generated is "*.out", where the "*" is replaced with the prefix of the input file name.

Line	Description	Type	Units
Line 1	Surf Header	Character	-----
Line 2	Blank Line	Character	-----
Line 3	SURF Model Version	Character	-----
Line 4	Date and Time of Forecast	Character	-----
Line 5	Output File Name Information	Character	-----
Line 6	Straight Coast Wave Refraction Option	Character	-----
Line 7	Landing Zone Name	Character	-----
Line 8	Sight Line Toward Beach	Real	Degrees
Line 9	Interval	Real	Feet
Line 10	Starting Depth	Real	Feet
Line 11	Depth Profile Name or Beach Slope	Character	-----
Line 12	Spectrum Usage Text	Character	-----
	Or		
	Sea Wave Height	Real	Feet
	Sea Period	Real	Seconds
	Sea Direction	Real	Degrees
Line 13	Spectrum File Name	Character	-----
	Or		
	Swell Wave Height	Real	Feet
	Swell Period	Real	Seconds
	Swell Direction	Real	Degrees
Line 14	Wind Speed	Real	Knots
Line 15	Wind Direction	Real	Degrees
Line 16	Tide Level	Real	Feet
Line 17	Blank Line	Character	-----
Line 18	Internal Grid Spacing	Real	Feet
Line 19	Significant Wave Height from Input File	Real	Feet
Line 20	Significant Wave Height from Straight Coast	Real	Feet
Line 21	Input Spectrum Type	Integer	-----
Line 22	Significant Wave Height Offshore	Real	Feet
Line 23	Stress Significant Wave Height	Real	Feet
Line 24	Stress Peak Frequency	Real	Hertz

Line	Description	Type	Units
Line 25	Stress Zero-Crossing Frequency	Real	Hertz
Line 26	Stress Peak Period	Real	Seconds
Line 27	Percentage Breaking Waves at Starting Depth	Real	Percent
Line 28	Self Starting Option	Character	-----
Line 29	Blank Line	Character	-----
Line 30	Text Heading - Surf Forecast	Character	-----
Line 31	Significant Breaker Height	Real	Feet
Line 32	Maximum Breaker Height	Real	Feet
Line 33	Dominant Breaker Period	Real	Seconds
Line 34	Dominant Breaker Type	Character	-----
Line 35	Breaker Percentages	Character	Percent
Line 36	Breaker Angle	Real	Degrees
Line 37	Littoral Current	Real	Knots
Line 38	Number of Surf Lines	Real	-----
Line 39	Surf Zone Width	Real	Feet
Line 40	Wind Speed	Real	Knots
Line 41	Wind Direction	Real	Degrees
Line 42	Blank Line	Character	-----
Line 43	Modified Surf Index	Real	-----

5.2.3 SURF 3.1 Data Only Output File

The data only output file contains columnar data most often used for plotting purposes. This file was created to ease the I/O reading for visual representation of the values. This matrix of values represents the cross-shore distributions of the variables defined in each column. The filename generated is "*.dat", where the "*" is replaced with the prefix of the input file name.

Line	Description	Type	Units
Line 1 - EOF	Index Number	Integer	-----
	Distance Offshore	Real	Feet
	Water Depth	Real	Feet
	Significant Breaker Height	Real	Feet
	Maximum Breaker Height	Real	Feet
	Percent Breaking Waves	Real	Percent
	Wave Length	Real	Feet
	Littoral Current	Real	Knots

5.2.4 SURF 3.1 Shallow Water Directional Wave Spectrum

The file is only created when Line 10 of the Surf input file contains a negative number. The format of this ASCII text file is a simple matrix of rows and columns. This file has the same file name as the output file except that the file extension will be "*.dws". The first row contains the center frequency bin definitions and the first column defines the wave direction bins. The heart of the matrix is the spectral wave energy per frequency and direction with the units m^2/Hz*radians. This spectrum has the same units as the input directional wave spectrum.

Line	Description	Type	Units	Range
Line 1	Frequency Bins	Real	Hertz	0 - 0.5
Line 2-EOF	Wave Direction, Wave Energy	Real	Degrees,	0 - 359
			m^2/Hz*rad	0 - 999

5.3 Subroutine Notes

Several subroutines are not called during normal execution of SURF 3.1 due to the internal settings of the default solution method. The default solution for the distribution of longshore current across the surf zone includes a linear bed stress term, which balances the longshore momentum equation. This option is selected when the variable lin_stress is set to FALSE; this variable is defined in the routine Surf.f. The following subroutines will not be called when the linear bed stress solution method is selected:

con_ang
fcn1
get_fcn
get_um
nonlin
nonlin2

These subroutines remain intact inside SURF 3.1 in case a user prefers to calculate longshore current velocities using a nonlinear bed stress. A user may change the default setting for lin_stress to TRUE to initiate a nonlinear bed stress solution. If the internal default settings are modified, SURF 3.1 should be recompiled before execution. The recommendation is to leave the longshore current flag lin_stress set to FALSE because the linear bed stress solution method is more robust. The nonlinear bed stress solution method may have difficulty converging for cross-shore transects with complicated bathymetry.

5.4 Acronyms

CNMOC	Commander, Naval Meteorology and Oceanography Command
DWS	Directional Wave Spectrum
EOF	End of File
Hz	Hertz
m	Meter
N	Newton
NRL	Naval Research Laboratory
MSI	Modified Surf Index
OAML	Oceanographic and Atmospheric Master Library
ONR	Office of Naval Research
RSM	Refraction/Shoaling Matrix
SPAWAR	Space and Naval Warfare Systems Command

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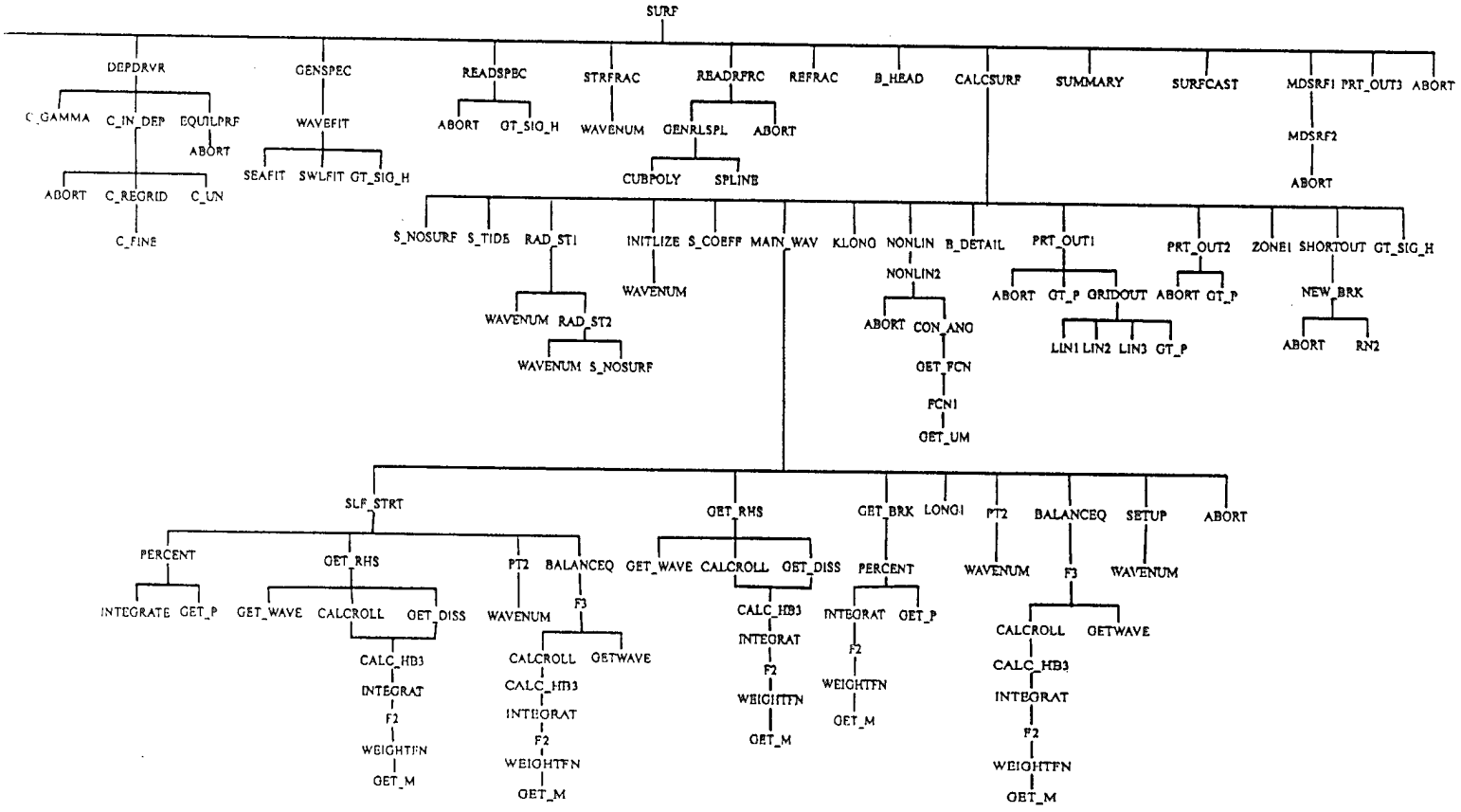
6.0 APPENDIX

Appendix A. SURF 3.1 Error Message Descriptions

Error Message	Subroutine Generating Error	Suggested Solution to Resolve Error
Error 105 - All input depths are less than starting depth. Check inputs. Program stopped.	C_IN_DEP	Decrease the starting depth -line 9 or extend the depth input profile farther offshore.
Error 115 - Opening Directional Wave Spectrum File.	READSPEC	Check Wave Spectrum name in the input file- line 5. Verify the location of the spectrum file is the same as the input file.
Error 120 - Opening input file.	SRFSETUP	Check the name of the input file typed at the command prompt (Surf3.1< InputFile) or the name typed during execution (Enter Input File Name).
Error 125 - Opening of Input Depth File.	C_IN_DEP	Check Depth Profile name in the input file - line 4. Verify the location of the depth file is the same as the input file.
Error 130 - Opening Refraction File.	READRFRC	Check Refraction name in the input file - line 6. Verify the location of the refraction file is the same as the input file.
Error 145 - Input depth profile has more data points than allowed. Check depth profile. Program stopped.	C_IN_DEP	The maximum number of depth points allowed is 500. Modify depth input file to contain only 500 depth values.
Error 150 - Large Internal grid spacing. Check depth profile.	DEPDRVR	Use the Self Start Option in the input file - line 9. Refer to the Self Start Option in Section 5.1.5.
Error 160 - No Convergence.	NONLIN2	Smooth the input depth profile.

Error 165 - No sediment type selected for Equilibrium Profile.	EQUILPRF	A Slope/Sediment Type was not set correctly in the input file line 8. The value must be inclusive of 1-10
Error 170 - No Surf.	SURF	Check the heading toward the beach in the input file, line 7 and the Spectrum Input File. Also, there may just be no surf in the area.
Error 180 - Problem gridding to output file. Program stops.	PRT_OUT1 PRT_OUT2	Check that the input depth profile extends to the beach shoreline and that the tide level - line 12 is not too high.
Error 185 - Problem with wave height values.	NEW_BRK	Check the input depth profile. The data may need to be smoothed due to unusual slopes. (Hint: too many negative slopes.)
Error 195 - Significant wave height outside surf zone less than 0.5 ft - no further calculations.	S_NOSURF	Check the heading toward the beach in the input file - line 7.
Error 200 - Surf forecasts are for situations when waves are more important than winds. This is not the case for input waves and winds. Forecasts may not be valid.	S_COEFF	Check the input wave and wind conditions in the input file - line 11 and line 12.
Error 205 - Water edge not found. Check tide and/or depths. Program stopped.	S_TIDE	The input depth profile must extend to the beach including the addition of a tide, if specified. There must be a depth at either 0.0, an onshore value, or an elevation.
Error 210 - Wave direction not toward the beach - no further calculations.	RAD_ST2	Check the heading toward the beach in the input file, line 7 and/or the directional wave spectrum file.
Error 215 - Wave induced set-up not converging to tolerance.	SETUP	The input depth profile must be smoothed.
Error 220 - Wave induced Set-up is not converging. Ending program.	MAIN_WAV	The input depth profile must be smoothed.

Appendix B. SURF 3.1 CSCI Architectural Design



Appendix C. Depth Profile Input File: medsand.dep

The file medsand.dep is routinely used in the majority of test cases as the Depth Input Profile.

File : medsand.dep

```
medium sand
1
1
    1  -20.00    -5.00
    2    0.00     0.00
    3   10.00     1.03
    4   20.00     1.64
    5   30.00     2.15
    6   40.00     2.61
    7   50.00     3.03
    8   60.00     3.42
    9   70.00     3.79
   10   80.00     4.14
   11   90.00     4.48
   12  100.00     4.80
   13  110.00     5.12
   14  120.00     5.42
   15  130.00     5.72
   16  140.00     6.01
   17  150.00     6.29
   18  160.00     6.57
   19  170.00     6.84
   20  180.00     7.11
   21  190.00     7.37
   22  200.00     7.62
   23  210.00     7.88
   24  220.00     8.12
   25  230.00     8.37
   26  240.00     8.61
   27  250.00     8.85
   28  260.00     9.08
   29  270.00     9.31
   30  280.00     9.54
   31  290.00     9.77
   32  300.00     9.99
   33  310.00    10.21
   34  320.00    10.43
   35  330.00    10.65
   36  340.00    10.86
   37  350.00    11.07
   38  360.00    11.28
   39  370.00    11.49
   40  380.00    11.70
   41  390.00    11.90
   42  400.00    12.10
   43  410.00    12.30
   44  420.00    12.50
   45  430.00    12.70
   46  440.00    12.90
   47  450.00    13.09
   48  460.00    13.28
   49  470.00    13.48
```

50	480.00	13.67
51	490.00	13.86
52	500.00	14.04
53	510.00	14.23
54	520.00	14.42
55	530.00	14.60
56	540.00	14.78
57	550.00	14.96
58	560.00	15.15
59	570.00	15.33
60	580.00	15.50
61	590.00	15.68
62	600.00	15.86
63	610.00	16.03
64	620.00	16.21
65	630.00	16.38
66	640.00	16.56
67	650.00	16.73
68	660.00	16.90
69	670.00	17.07
70	680.00	17.24
71	690.00	17.41
72	700.00	17.57
73	710.00	17.74
74	720.00	17.91
75	730.00	18.07
76	740.00	18.24
77	750.00	18.40
78	760.00	18.57
79	770.00	18.73
80	780.00	18.89
81	790.00	19.05
82	800.00	19.21
83	810.00	19.37
84	820.00	19.53
85	830.00	19.69
86	840.00	19.85
87	850.00	20.00
88	860.00	20.16
89	870.00	20.32
90	880.00	20.47
91	890.00	20.63
92	900.00	20.78
93	910.00	20.93
94	920.00	21.09
95	930.00	21.24
96	940.00	21.39
97	950.00	21.54
98	960.00	21.69
99	970.00	21.84
100	980.00	21.99
101	990.00	22.14
102	1000.00	22.29
103	1010.00	22.44
104	1020.00	22.59
105	1030.00	22.74
106	1040.00	22.88
107	1050.00	23.03
108	1060.00	23.18

109	1070.00	23.32
110	1080.00	23.47
111	1090.00	23.61
112	1100.00	23.76
113	1110.00	23.90
114	1120.00	24.04
115	1130.00	24.19
116	1140.00	24.33
117	1150.00	24.47
118	1160.00	24.61
119	1170.00	24.75
120	1180.00	24.89
121	1190.00	25.03
122	1200.00	25.17
123	1210.00	25.31
124	1220.00	25.45
125	1230.00	25.59
126	1240.00	25.73
127	1250.00	25.87
128	1260.00	26.01
129	1270.00	26.14
130	1280.00	26.28
131	1290.00	26.42
132	1300.00	26.55
133	1310.00	26.69
134	1320.00	26.83
135	1330.00	26.96
136	1340.00	27.10
137	1350.00	27.23
138	1360.00	27.37
139	1370.00	27.50
140	1380.00	27.63
141	1390.00	27.77
142	1400.00	27.90
143	1410.00	28.03
144	1420.00	28.16
145	1430.00	28.30
146	1440.00	28.43
147	1450.00	28.56
148	1460.00	28.69
149	1470.00	28.82
150	1480.00	28.95
151	1490.00	29.08
152	1500.00	29.21
153	1510.00	29.34
154	1520.00	29.47
155	1530.00	29.60
156	1540.00	29.73
157	1550.00	29.86
158	1560.00	29.99